MOVING PEOPLE:
TOWARDS SUSTAINABLE MOBILITY
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Europe’s transport policy has come to a crossroads. The pending reorganisation of the transport systems will require new solutions if the main goals are to be met:

- to reduce the burden on the environment (reduction of greenhouse gases and local pollution);
- to contribute to the security of the energy supply (reduction of dependency on fossil fuels);
- to make Europe’s regions more competitive;
- to improve the quality of life for the citizens of Europe.

The need for new solutions applies in particular to Europe’s major cities and their respective regions. Metropolitan cities and regions depend on good internal mobility. Against this background, the unique partnership of seven Metropolitan Regions in Catch-MR has found a strong common interest. Like beads on a string, Oslo, Gothenburg, Berlin, Vienna, Budapest, Ljubljana and Rome stretch from the northern shores of Europe to the Adriatic. These cities represent the growth cores in an emerging corridor that links northern, central and southern Europe along the dynamic territory of the former east-west divide.

► Metropolitan Regions in the focus of innovation

Establishing efficient, environmentally friendly transport systems is a key issue for the future development of the European Metropolitan Regions. As transport hubs, they are particularly affected by the environmental impacts of traffic – noise, local air pollution, congestion, accidents, infrastructure barriers, poisoned land and loss of green areas. However, as the motors that drive Europe’s economic development, they also have the capacity to plan, fund and implement the new transport solutions. These aspects were reflected in the choice of topics for joint work in the project Catch-MR:

- Transport and land-use planning – reducing the need for transportation;
- Encouraging more use of public transport – increasing the share of efficient modes;
- Renewable energy in transport – increasing the use of more energy-efficient and low-emission technologies;
- Regional cooperation and policy coordination – facilitating joint approaches for the metropolis and the region.

The EU White Paper “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” (2011) signals the need to strengthen mobility. The partners of Catch-MR are similarly convinced that their contribution to achieving the goals of Europe 2020 will be significant.

■ Lessons learned from the exchange of experiences

As an INTERREG IVC project, Catch-MR has aimed to identify good practice examples from the participating Metropolitan Regions. The partners found many issues and approaches that they have in common. They were inspired by the determination shown by politicians and their regional cooperation partners to achieve new solutions based on the opportunities – and limitations – presented by each Metropolitan Region’s unique setting.

The findings of the Catch-MR partners will motivate local bodies to continue to work for more sustainable and competitive solutions. Conclusions and recommendations have been forwarded to help
Europe’s Metropolitan Regions develop sustainable mobility solutions. The results can also motivate bodies at the national and European level to intensify the support given more generally to cooperative actions in Metropolitan Regions.

► Land-use and transport planning

With increasing access to private cars, people’s mobility has increased and settlement preferences have changed. Living in less densely built-up environments that surrounded cities is more attractive than before. Dispersed development patterns linked by infrastructure for motorised transport are often a result of this development, known as urban sprawl.

Understanding the driving forces of urban sprawl is an important step towards effective planning strategies. Although the seven participating Metropolitan Regions differ in a number of ways, important similarities concerning urban sprawl have been identified:

• Quality of life in terms of available living space and accessibility are key factors for the choice of the housing location;
• Overall mobility-related costs in the region are generally higher than in the core city, but they are balanced by higher housing costs in more central locations.

■ Enhancing cooperation across administrative borders

As long as there is a continuing increase and improvement in the infrastructure for commuting by car, urban sprawl is likely to continue. How can planners reduce urban sprawl, or at least its negative effects? To find answers, the following approaches in particular have been investigated:

• Metropolitan Area Management Vienna-Lower Austria: Efficient activation of cooperation (e.g. regional projects), provision of support on controversial issues by intermediation and by crossing mental barriers (influenced by administrative borders);
• Gothenburg Region Association of Local Authorities: Creation of joint understanding of the need for integrated transport and land-use planning, taking joint responsibility for a sustainable regional structure and regional growth;
• Joint Spatial Planning Department Berlin-Brandenburg: Provision of a reliable framework for the development of rules and procedures, leading to predictable conditions for investments irrespective of administrative borders.

■ Towards better integration of land-use and transport policy

By analysing the practical examples, key factors for success have been identified. They are related to the creation of a regional vision for land-use and transport policy, the facilitation of cooperation through regional governance, broad involvement as a means to reach joint understanding and the need to develop local and tailor-made solutions. Models of cooperation cannot always be transferred directly from one region to another, but they serve as important sources of inspiration.

The partners recommend integrating land-use and transport planning throughout the Metropolitan Region as a whole, including all relevant sectors. Future developments should be planned near transport nodes and along the axes of public transport services, enabling the operation of a polycentric public transport network that gives access to the all functional parts of each Metropolitan Region. At the same time, dense development patterns are an important prerequisite for sustainable mobility. Goods and services should be accessible within walking and cycling distance, and an adequate supply of green and open spaces should contribute to attractive public space. Cities must be attractive to live and work in, and to move through.

► Encouraging more use of public transport

In the past, mobility has especially been increased in Metropolitan Regions by building more roads, which have given individuals access and freedom to choose when and where to travel. Cars have become more attractive than public transport in most suburbs and neighbouring towns. In cities and their surroundings however, the sum of individuals’ freedom to travel creates congestion and negative environmental effects.

Based on the experiences from the participating regions, local and regional strategies to increase the use of public transport have been reviewed:
**Coordinated financing and organisation**

Financing public transport is probably the most crucial factor in increasing its attractiveness and use. Long-term funding stability is essential for a well-functioning public transport system. As experience from Berlin-Brandenburg and Oslo-Akershus demonstrates, simplifying the funding and management structure – e.g. separating the transport authority and operator(s), simplifying funding mechanisms and fare structures – makes the system more efficient, and also helps public owners in making strategic decisions.

Policy for financing public transport in Metropolitan Regions has to be developed in a strategic way. It is important to develop long-term, realistic goals that are not influenced by day-to-day issues. Subsidiarity is important, i.e. finding the best administrative level for decisions and administrative work relating to financing for public transport.

**Enhancing intermodality**

Intermodal nodes are an essential feature of a well-functioning public transport system in Metropolitan Regions. Ideally, they provide access to a variety of different modes of public transport: regional trains, local trains, subways, buses, etc., but also to taxis and bikes. Quick, comfortable and safe interchange is the main aim of intermodal nodes, but additional functions such as shops, restaurants, cafés and other services help to make them even more attractive. Intermodal nodes should also include ICT solutions, like travel information systems, that give real-time information about intermodal journeys, thus making cross-regional travel by public transport more accessible.

**Building and operating park & ride**

Park & ride is a type of intermodal node, and one of many possible solutions for making public transport more accessible. Using park & ride is an alternative to using a car for the whole journey, and should not be seen as an alternative to public transport use. This should be reflected in the choice of locations, capacities and price structure. Cost-efficiency should always be kept in mind when deciding about park & ride developments. Bike and ride systems should also be given priority.

**Activating new sources of funding – Road user charging**

Road user charging can serve different goals (funding, traffic reduction), and the different goals require different pricing structures. Strong political support is needed for implementation, while long-term agreements are a key to the stability of the system. Transparent financial management is essential; revenues must be used for transport purposes alone, and the public must be given strong guarantees.

The relevance of long-term visions is impressively demonstrated by the toll ring in Oslo-Akershus, which was introduced in 1990 to finance road developments. Today, its revenues also support the development and operation of public transport. In the Gothenburg Region congestion charging will be introduced in 2013, and according to their K2020 strategy, the use of public transport will be doubled by 2020.

**Renewable energy in transport**

Transportation in Europe will need to undergo profound transitions to meet sustainability requirements according to present criteria. The sector faces environmental, social, and economical challenges, which are mainly related to the use of energy based on fossil fuels and the need to reduce CO₂ emissions significantly.

In nearly all regions energy strategies or action plans are already in place. But the focus has not yet been placed on transport, although in all regions the share of renewable energy production in relation to the total energy consumption is increasing. Which renewable energy sources are used differs significantly between the regions (e.g. mainly hydroelectric power in Oslo-Akershus, wind energy in Berlin-Brandenburg, solid biomass in Ljubljana), and diversity is expected to increase.

**Deployment of alternative propulsion systems**

The deployment of alternative propulsion systems is still at a very low level. In road transport, the highest deployment rates are related to the use of compressed natural gas and hybrid motors. Except in Oslo-Akershus, electric vehicles are not yet used on a larger scale. In public transport the situation...
looks different – electric motors or motors using compressed natural gas are widely deployed. In Oslo-Akershus, all tracked public transport uses hydroelectric power, and in Gothenburg more than 25% of the non-electric energy demand of public transport is already covered by renewable energies.

It is clear that simply replacing fossil fuel cars with non-fossil fuel cars would not be sufficient to achieve the desired transition in the transportation system. Sources of energy, mobility behaviour and the changing needs of transportation users have to be taken into account, too.

■ Practical experiences and visions

The partners consider battery-driven electric cars suitable for greener transport solutions, but barriers such as their limited range or high purchasing costs make them currently affordable only for high-income households. Oslo-Akershus and Berlin-Brandenburg, amongst others, have implemented policies to support electric vehicles, and pilot studies such as mobility platforms are being realised. Besides cars, electrically supported bicycles have gained attention and market penetration.

The production of biofuels depends on access to the raw materials, but also on the acceptance of the population, especially with regard to ethical concerns. Several partner regions are investing in biogas production, and in particular in Gothenburg it is planned to fuel the region’s public and private transportation vehicles with biogas on a large scale.

In public road transport, the focus is rather on efficient buses and the reduction of noise and local pollution. Buses relying on alternative propulsion systems, such as hybrid buses, hydrogen, electric, and compressed natural gas, have advantages regarding these aspects and may use renewable energies at the same time. In electrified rail transport, the use of renewable energies does not require any investments, but it is difficult to gain acceptance for higher cost.

As the potential for renewable energy production is quite limited in most major cities, but comparatively large in their surrounding rural areas, the concept of “regional energy partnerships” might be a way to foster the expansion of renewable energy in Metropolitan Regions. If sufficient capacities for buffering and storage of excess power from fluctuating sources (e.g. hydrogen from wind power as in Berlin-Brandenburg) are created, renewable energies could gain much wider acceptance among the population.

► Regional cooperation and policy coordination

Good living conditions and active local stakeholders are core elements of successful Metropolitan Regions. Thus all partner regions are striving for better cooperation: between the metropolis and its functional area (the region), between different sectors, especially land-use and transport planning, and among formal and informal actors/stakeholders. Modes of management are evolving with forms of governance linking governing bodies, and cooperation between different units and bodies is being strengthened.

■ Observations in partner regions

In some cases, the Metropolitan Regions have established joint bodies – for example, the Berlin-Brandenburg Joint Spatial Planning Department, the Berlin-Brandenburg Joint Transport Association, and the Vienna-Lower Austria Eastern Region Transport Association. In other cases cooperation has developed at the request of the national government, e.g. coordinating the traffic and land-use planning in the Oslo-Akershus region.

There have been several cases in which administrative units have cooperated voluntarily and now use joint management arrangements, or other forms of governance, to develop more suitable solutions that meet wider, regional objectives, for example, the Gothenburg Region Association of Local Authorities and the Vienna-Lower Austria Metropolitan Area Management. In the Ljubljana Urban Region, a Regional Development Agency has been formed, which supports economic, social and cultural activities in the municipalities of central Slovenia, mainly through regional development planning and different projects.

Regions with a lower intensity of cooperation are in the minority, however here as well promising initiatives can be observed. In Budapest the creation of a single transport agency, the Centre for Budapest Transport, has delivered a new quality to the coordination of the development of transportation systems across different modes. In the Province
of Rome, transport and land-use plans are well coordinated at each administrative level, but are less coordinated between different tiers of government. Thus the Provincial government has proposed creating a single mobility agency to improve the services delivered to the population.

- **Cooperation makes the difference**

Summarising the findings of the partnership, there are four main paths towards tackling metropolitan regional transport challenges: joint decision-making, joint transport companies, joint planning and joint financing.

In each case, the historical background, traditions, and cultures in the participating Metropolitan Regions are reflected in the various forms of cooperation that exist between the Metropolises and their surrounding areas. The examples of cooperation have led us to conclude that there is no single model for connecting all the metropolises and their respective regions. Both informal cooperation in the sense of voluntary, participatory decision-making, and the establishment of a more formalised joint institution in charge of developing the policies for all the units included can be successful. In both cases, success is strongly dependent on the ability of governing bodies to reach agreement about how to coordinate sectoral and territorial interests, as well as tiers of government across the region.

The task of joint bodies should first and foremost be integrated strategic planning, as defined by the actors that are involved. In particular the coordination of transport and land-use planning is essential if satisfactory results are to be achieved.

The involvement of wider groups of stakeholders can also help to ensure long-term acceptability of the visions and joint strategies. In this way, a wide range of interests and knowledge can be taken into account. Achieving agreement on the main points in a joint integrated strategic plan is of key importance, which should be mandatory and binding for developers and land-use and transport planning authorities as far as this is politically possible, and include instruments for implementation, including joint financing.
1 INTRODUCTION

1.1 Cooperative approaches to transport challenges in Metropolitan Regions (Catch-MR)

The INTERREG IVC project Catch-MR was conceived in 2008 – a tumultuous year for Europe. A period of more than a decade of continuous growth, which also encompassed the enlargement of the European Union (EU) in 2004, had come to an end. Ambitious European goals of increasing competitiveness, strengthening social cohesion and a transition to a low-carbon economy were challenged by financial turmoil. Many states were under increasing pressure to stimulate growth in their flagging economies. The need to support efficient and effective development with smart transport was becoming clearer.

Creating efficient mobility within Metropolitan Regions

Against this background, the unique partnership of seven Metropolitan Regions has found a strong common interest. Like beads on a string, Oslo, Gothenburg, Berlin, Vienna, Budapest, Ljubljana and Rome stretch from the northern shores of Europe to the Adriatic. These cities represent the growth cores in an emerging corridor that links northern, central and southern Europe, along the dynamic territory of the former east-west divide. The partners build on the potential strength that lies in this transit axis as the backbone for major infrastructure investments in the years ahead. The biggest potentials lie in creating efficient and effective mobility within each Metropolitan Region. Without this, stronger links between the Metropolises will be of only limited benefit.

A background of contrasts and the strength of a common cause

Much as the EU White Paper “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” (2011) signals the need to strengthen mobility, the partners of Catch-MR are convinced that their contribution to achieving the goals of Europe 2020 will be significant. The partnership represents some of Europe’s largest and smallest capitals; the seven Metropolitan Regions also include some of Europe’s wealthiest areas, as well as large communities struggling for a better future. Against this background of contrasts, the strength of the common cause and desire to achieve the best for each city and for each region is striking. The partners have found many issues and approaches that they all share. They have been inspired by the determination shown by politicians and their regional cooperation partners to achieve new solutions based on the opportunities – and limitations – presented by each city’s unique setting.

Towards more sustainable and competitive solutions

The findings of the Catch-MR partners should motivate local bodies within each of the seven Metropolitan Regions to continue to work for more sustainable and competitive solutions. In addition, conclusions and recommendations have been identified which should help Europe’s Metropolitan Regions to develop sustainable mobility solutions. The results should also motivate bodies at the national and European levels to significantly increase the support given to cooperative action in the field of metropolitan development.
1.2 A European Challenge

Europe’s transport policy has come to a crossroads. The pending reorganisation of the transport systems demands new solutions in order to achieve the main goals:

- to reduce the burden on the environment (reduction of greenhouse gas emissions);
- to contribute to the security of the energy supply (reduction of dependency on oil and oil products);
- to make Europe’s regions more competitive;
- to improve the quality of life for the citizens of Europe.

At the same time, transport is of great importance for Europe (Roadmap … 2011):

“Transport is fundamental to our economy and society. Mobility is vital for the internal market and for the quality of life of citizens as they enjoy their freedom to travel. Transport enables economic growth and job creation; it must be sustainable in the light of the new challenges we face. Transport is global, so effective action requires strong international cooperation.”

This applies in particular to Europe’s major cities and their respective regions. Metropolitan cities and regions live from and through mobility, with the three major transport flows coming into play:

- urban transport within the cities;
- regional transport between the cities and their regions;
- national and European long-distance transport.

Establishing efficient, environmentally friendly transport systems is a key issue for the future development of the European Metropolitan Regions. Since “curbing mobility is not an option” (Roadmap … 2011), ambitious aims have been formulated: by 2050 greenhouse gas emissions in the transport sector shall be reduced by at least 60% with respect to 1990 levels, and the use of “conventionally fuelled” vehicles in urban transport shall be halved by 2030.

The Metropolitan Regions are at the forefront in dealing with these challenges. Being transport hubs, they are particularly affected by the environmental impacts of traffic – noise, pollution (especially particulate matter and resulting health problems), congestion, accidents, infrastructure barriers, soil sealing and loss of green areas. But as the motors that drive Europe’s economic development, they also have the means and the possibilities of planning, funding and implementing the necessary reorganisation of the transport systems.
1.3 Catch-MR deals with the future of passenger transport

It is clear that transport policy has to move in new directions. Approaches aimed at mere infrastructure expansion and construction of new and wider roads have reached their limits. "More of the same" no longer works, in financial or in ecological terms. It is necessary to find new solutions, taking a holistic view of transport in all its complexity while giving due consideration to ecological, economic and social requirements.

Therefore over a period of three years, seven European Metropolitan Regions have worked together in the Catch-MR project, investigating "Cooperative Approaches to Transport Challenges in Metropolitan Regions (Catch-MR)".

The aim has been to identify integrated approaches to a viable transport policy for Metropolitan Regions, considering in particular the relations between Metropolises and their Regions. To keep the project on a manageable scale, the cooperation has focused on passenger transport.

The project has followed the A-S-I approach, covering the dimensions of system efficiency (A – avoid/reduce), trip efficiency (S – shift/maintain) and vehicle efficiency (I – improve).

Thirdly, the "improve" component focuses on vehicle and fuel efficiency as well as on the optimisation of transport infrastructure. It aims to improve the energy efficiency of transport modes and related vehicle technology, acknowledging as well the potentials of alternative energy use.

Within the project, these aspects were reflected through the choice of topics for joint work:

- transport and land-use planning;
- encouraging more use of public transport;
- renewable energy in transport;
- regional cooperation and policy coordination.

The reader will find this same structure followed throughout the guide.
1.4 Based on experience and good practice

A brief comparison of the topics and goals of Catch-MR with those of the EU White Paper (Roadmap ... 2011) indicates the particular value of the approach for the European discussion:

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<td>Catch-MR</td>
<td>Increasing the use of public transport for motorised trips.</td>
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<td>Catch-MR</td>
<td>Increasing the use of more energy-efficient and low-emission modes in both private and public transport.</td>
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As an INTERREG IVC project, Catch-MR aimed to identify good practice examples from the participating Metropolitan Regions. So the material core of the project consisted of the experience shared among the participating regions, supplemented by supporting regional studies. Each Metropolitan Region contributed to this exchange through the organisation of a thematic...
workshop, which was prepared through written inventories. Experts on the various topics from the participating regions also attended the workshops. During regional dissemination workshops and in newsletters the partners published the findings obtained from the cooperation and ensured that local stakeholders were informed and involved. Through these activities and the subsequent draft of regional policy papers the partners actively facilitated the transfer of findings to the participating regions.

Finally, the partnership and preliminary findings were presented at national and international conferences during the course of the project.

1.5 A partnership of high relevance

The following Metropolitan Regions were involved in the project, six of which are capital regions. In geographical order, from north to south:

- the City of Oslo-County of Akershus (Norway);
- the Gothenburg Region (Sweden);
- the Capital Region Berlin-Brandenburg (Lead Partner, Germany);
- the Vienna Metropolitan Region (Austria);
- the Central Hungarian Region (Hungary);
- the Ljubljana Urban Region (Slovenia);
- the Province of Rome (Italy).

The partnership enabled both the cities and the surrounding regions to be represented. Depending on their respective constitution, each Metropolitan Region was represented by institutions responsible for land-use planning and transport. So the project comprised 12 partner institutions from the participating regions.

The cooperation ran from January 2010 to December 2012, with a total budget of 2 million Euro. In this period the partners met for the following workshops:

- Transport and land-use planning: “Achieve new planning solutions” (Gothenburg) and “Understanding urban sprawl” (Vienna-Lower Austria);
- Encouraging more use of public transport: “Intermodality, park & ride” (Budapest) and “Charging car users” (Oslo-Akershus);
- Renewable energy in transport: “Affordable technology” (Rome) and “Developing the infrastructure” (Berlin-Brandenburg);
- Connecting regional and local transport policy: “Funding, governance and implementation” (Ljubljana).

The final conference took place in November 2012 in Rome.
1.6 PORTRAITS OF CATCH-MR REGIONS

In this section the participating Metropolitan Regions are briefly characterised, summarising their main features. The descriptions will help the reader to understand the specific situation of each partner that has led to the need for the development of tailor-made strategies.

1.6.1 The City of Oslo-County of Akershus

The region

The Oslo Metropolitan Region comprises the City of Oslo and the County of Akershus. Oslo is Norway’s only Metropolis, consisting of a compact urban core surrounded by forests, agriculture and coastline. By population, Akershus is the second largest county in Norway. Although politically independent of each other, Oslo and Akershus work jointly in many key areas.

The strengths of the area include a robust finance sector and regional economy, healthy living conditions, high quality of life and being technically advanced. Weaknesses are related to a peripheral location in Europe, high prices and lack of venture capital. Mobility is high, with more than two-thirds of the working population travelling to jobs outside the boroughs or municipalities in which they live.

62% of public transport journeys are by rail, tram or metro and a third of all motorised transport passenger traffic is now accounted for by public transport. The bus operating company aims for its fleet to be fossil fuel free by 2020.

Road user charging has been in place since 1991 to raise funds for transport investments such as expansion of the road and public transport network, new technology systems and transport terminals. Since 2008, road tolls have also been used to subsidise public transport services in the region. The regional airport provides national and international links and is connected to the city centre by a new high-speed rail line. In common with a growing number of European cities, Oslo has a bike rental scheme.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>426</td>
<td>4,579</td>
<td>5,005</td>
</tr>
<tr>
<td>Inhabitants (2012)</td>
<td>613,000</td>
<td>556,000</td>
<td>1,169,000</td>
</tr>
<tr>
<td>Inhabitants/km² (2012)</td>
<td>1,439</td>
<td>121</td>
<td>234</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>15 districts</td>
<td>22 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)*</td>
<td>69,000</td>
<td>41,000</td>
<td>56,000</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2006)</td>
<td>370</td>
<td>503</td>
<td>– 420</td>
</tr>
<tr>
<td>Passengers in public transport per day (2006)</td>
<td>597,000</td>
<td>183,000</td>
<td>780,000</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2007)</td>
<td>▲ 100,000</td>
<td>40,000 ▶</td>
<td>140,000</td>
</tr>
</tbody>
</table>

* 1 Euro = 7.5 NOK.
The partners

The Akershus County Council is a directly elected regional authority. They have responsibility for education and transport, including regional highways and procurement of public transport. In addition, the County Council is responsible for regional development matters, environmental policy, cultural services and heritage, and land-use strategies. The County comprises 22 municipalities, which are responsible for detailed and legally binding land-use planning, as well as primary health care, social services, schools and technical services.

The City of Oslo is also directly elected. The City has responsibility for all the functions that are otherwise split between the counties and municipalities in Norway. This means that land use and transportation are decided by the same political body. Most planning and service provision is organised through central and city-wide departments, but 15 city-districts are responsible for primary health care, social services and kindergartens.

Oslo and Akershus have agreed on formal cooperation for the following themes:

- Economic development strategy (since 1996);
- Funding and management of the toll ring and investment programmes (since 1990);
- Procurement of public transport (since 2008);
- Land-use and transport planning (since 2009).

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1.6.2 The Gothenburg Region

The Gothenburg Region is situated in western Sweden and consists of 13 municipalities forming one integrated region in terms of economy, labour market and infrastructural investments. The region is one of the four regional associations of local authorities in the Region Västra Götaland and is one of the fastest growing regions of northern Europe. The region’s strategic position with the City of Gothenburg as the regional core provides both opportunities and challenges in terms of long-term sustainable development.

Since 2002 the Gothenburg Region Association of Local Authorities (GR) has been carrying on a constructive dialogue between the executive board and the member municipalities which is based on the common vision of sustainable development. Four regional consultation rounds have been realised so far with the overall objective of creating an unprejudiced political dialogue on common issues. The consultation rounds have resulted in regional goals and strategies, political agreements and policy documents on spatial development and sustainable growth.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>655</td>
<td>3,063</td>
<td>3,718</td>
</tr>
<tr>
<td>Inhabitants (2010)</td>
<td>609,808</td>
<td>318,821</td>
<td>928,629</td>
</tr>
<tr>
<td>Inhabitants/km² (2010)</td>
<td>931</td>
<td>104</td>
<td>250</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>10 districts</td>
<td>12 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)</td>
<td>43,259</td>
<td>35,569</td>
<td>20,995</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2008)</td>
<td>356</td>
<td>494</td>
<td>403</td>
</tr>
<tr>
<td>Passengers in public transport per day (2010)</td>
<td>495,000</td>
<td>101,000</td>
<td>~ 596,000</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2011)</td>
<td>65,600</td>
<td>17,600</td>
<td>~ 83,200</td>
</tr>
</tbody>
</table>
The Gothenburg Region Association of Local Authorities (GR) is a cooperative organisation for shaping political consensus and cooperation uniting 13 municipalities in western Sweden. The task of the organisation is to enhance intermunicipal cooperation between its member municipalities and to provide a regional platform for networking and exchange of experiences.

The GR contributes to long-term sustainable development. Such development covers three basic and mutually dependent dimensions – the social, the environmental and the economic. The GR focuses on issues such as: regional planning, environment, traffic, labour market, welfare and social services, competence development, education and research. The GR is the regional planning authority and is also assigned to coordinate all regional infrastructure investments within the region.
1.6.3 The Capital Region Berlin-Brandenburg (Lead Partner)

The federal states of Berlin and Brandenburg form together the German Capital Region, which is situated in the centre of the enlarged Europe. The Capital Region is characterised by a diverse structure: the City of Berlin, the largest German Metropolis as regards size and population and which has a high density of population, is surrounded by the sparsely populated federal state of Brandenburg. This structure offers a lot of chances as well as challenges. Thus a close collaboration within the Capital Region is a key condition for its sustainable development. Since 2006 the Region has been acting under one label as the Capital Region Berlin-Brandenburg. Its foundation is the “Model for the Capital Region Berlin-Brandenburg”, a guiding concept which identifies strengths as well as potentials and determines common goals for the future.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>892</td>
<td>29,482</td>
<td>30,374</td>
</tr>
<tr>
<td>Inhabitants (2010)</td>
<td>3,460,700</td>
<td>2,503,300</td>
<td>5,964,000</td>
</tr>
<tr>
<td>Inhabitants/km² (2010)</td>
<td>3,881</td>
<td>85</td>
<td>196</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>12 districts</td>
<td>14 counties 4 county-free cities 415 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)</td>
<td>26,741</td>
<td>21,547</td>
<td>24,144</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2010)</td>
<td>321</td>
<td>521</td>
<td>421</td>
</tr>
<tr>
<td>Passengers in public transport per day (2010)</td>
<td>–</td>
<td>–</td>
<td>3,470,000</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2011)</td>
<td>183,000 73,000</td>
<td>256,000</td>
<td></td>
</tr>
</tbody>
</table>
The partner

The Joint Spatial Planning Department Berlin-Brandenburg (GL) – set up in 1996 – is responsible for regional development and state planning in Berlin and Brandenburg. It is part of both the Berlin Senate Department for Urban Development and the Environment and the Brandenburg Ministry for Infrastructure and Agriculture. On the federal level, the Department is the only federal state authority in Germany responsible for two federal states in the field of regional development.

The Department creates important fundamentals for promoting growth and developing the infrastructure of the entire region. Thus, it contributes to the strengthening of the competitiveness of the Metropolitan Region in the national as well as in the international context. Along with formal regional planning (at state level) an emphasis is put on informal planning in order to support regional development and accelerate the implementation of regional policies.

The Joint Spatial Planning Department Berlin-Brandenburg has been Lead Partner of the project Catch-MR.

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The region

The City of Vienna (municipality and federal province) and parts of the federal province of Lower Austria jointly form the Vienna Metropolitan Region, situated in the east of Austria close to the Slovak border and the Slovak capital Bratislava. In 1922 Vienna and Lower Austria were separated into two federal states, but Vienna remained the official capital of Lower Austria until Sankt Pölten was declared the capital of Lower Austria in 1986.

Despite this “political separation” the city and the surrounding areas collaborate very closely.

The cooperation is intensified year by year. Common planning goals, joint research in planning-related issues and coordination of land-use and transport planning have been institutionalised for more than three decades (e.g. Planning Association East (PGO), Transport Association East Region (VOR), Wienerwald Biosphere Reserve).

Sustainable development – especially regarding transport and land-use planning – is a great challenge for the region, but it must be provided to ensure good living conditions for the citizens.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>415</td>
<td>5,390</td>
<td>5,805</td>
</tr>
<tr>
<td>Inhabitants (2011)</td>
<td>1,714,100</td>
<td>788,400</td>
<td>2,502,500</td>
</tr>
<tr>
<td>Inhabitants/km² (2011)</td>
<td>4,132</td>
<td>146</td>
<td>431</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>23 urban districts</td>
<td>201 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)</td>
<td>42,600</td>
<td>29,732</td>
<td>38,546</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2010)</td>
<td>390</td>
<td>664</td>
<td>503</td>
</tr>
<tr>
<td>Passengers in public transport per day (2010)*</td>
<td>–</td>
<td>–</td>
<td>2,488,500</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2011)</td>
<td>▶ 159,000</td>
<td>56,500 ▶</td>
<td>215,500</td>
</tr>
</tbody>
</table>

* VOR service area, which extends beyond the area of the Vienna Metropolitan Region.
The partners

The City of Vienna – Municipal Department 18, Urban Development and Planning elaborates objectives for urban development (including transport) and the respective strategic documents, determining the path towards these goals and evaluating the progress. Consideration of the regional aspect and international exchange are inherent to the department’s work.

The Provincial Administration of Lower Austria – Department for Spatial Planning and Regional Policy is responsible for regional development and spatial planning on the level of the province, but also on a regional level. The basic challenge is to develop and coordinate sector and regional strategies in accordance with the development strategy on the federal state level.

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1.6.5 The Central Hungarian Region

The region

One of the seven statistical regions of the country, Central Hungary is composed of Budapest and the surrounding Pest County. It is the most densely populated and most developed region of Hungary – its GDP per capita exceeds even the EU-27 average. Numerous inhabitants of the region work in the city, causing huge flows of daily commuter traffic at the city boundaries.

Budapest consists of 23 districts with a special dual self-government system. This means that in addition to the Municipality of the City of Budapest, each of the 23 districts has its own local government, with elected mayors and a local council. The Municipality of the City of Budapest and the district governments are equal in terms of their basic rights, with no hierarchic relationship.

Local government tasks are generally implemented by the district governments, while tasks resulting from the city’s nationwide scope or related to several districts or the city as a whole are realised by the Municipality of the City of Budapest. One of these tasks is the organisation of the transportation for the city. For this purpose, the Municipality established the Centre for Budapest Transport (BKK) as the new transport-organising authority of Budapest.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>525</td>
<td>6,391</td>
<td>6,916</td>
</tr>
<tr>
<td>Inhabitants (2010)</td>
<td>1,721,556</td>
<td>1,229,880</td>
<td>2,951,436</td>
</tr>
<tr>
<td>Inhabitants/km² (2010)</td>
<td>3,279</td>
<td>192</td>
<td>427</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>23 district-municipalities</td>
<td>188 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)</td>
<td>20,714</td>
<td>7,746</td>
<td>15,325</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2010)</td>
<td>333</td>
<td>340</td>
<td>336</td>
</tr>
<tr>
<td>Passengers in public transport per day (2010)</td>
<td>3,717,808</td>
<td>572,602</td>
<td>4,290,410</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2011)</td>
<td>208,000</td>
<td>122,000</td>
<td>330,000</td>
</tr>
</tbody>
</table>
The Municipality of the City of Budapest is one of the largest institutions in Hungary, with high capability in the management and execution of large projects. Besides the high-priority management of urban infrastructure programmes, Budapest is participating in several EU-funded projects. The Municipality’s responsibility is city development, including environment, urban and land-use planning, while transportation issues are handled by the Centre for Budapest Transport (Budapesti Közlekedési Központ – BKK). In order to cope with these two key areas effectively a close cooperation between the Municipality and BKK is in force.

In 2010, the Centre for Budapest Transport (Budapesti Közlekedési Központ – BKK) was established as the integrated transport-organising authority of Budapest as part of the new city management model. BKK was created to integrate public transport, cycling, road infrastructure management, city parking, taxi services and the management of transport-related EU projects under one large umbrella – modelled primarily on Transport for London. Tasks and responsibilities of the management of transport – previously handled by various organisations – have been taken over by BKK during the course of 2011–2012.
1.6.6 The Ljubljana Urban Region

The region

The Ljubljana Urban Region is the most prosperous Slovenian region, with high development potential and economic strength. It generates a third of the Slovenian GDP.

The region is geographically situated in central Slovenia at a well-passable and strategic location, between the Alps and the Mediterranean, on the route from central Europe to the Danube region and Italy (Adriatic ports). Both Slovenia and Ljubljana are included with their public service infrastructure in the Trans-European Networks (TEN) as part of the Trans-European Transport Corridors V and X, energy and maritime transport corridors. With the entry of Slovenia into the EU and the Schengen area the international transport and transit position of Ljubljana and Slovenia has been further strengthened.

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Region</th>
<th>Metropolitan Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>275</td>
<td>2,280</td>
<td>2,555</td>
</tr>
<tr>
<td>Inhabitants (2011)</td>
<td>280,140</td>
<td>253,073</td>
<td>533,213</td>
</tr>
<tr>
<td>Inhabitants/km² (2011)</td>
<td>1,019</td>
<td>111</td>
<td>209</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>–</td>
<td>25 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2009)</td>
<td>–</td>
<td>–</td>
<td>24,660</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2010)</td>
<td>520</td>
<td>535</td>
<td>527</td>
</tr>
<tr>
<td>Passengers in public transport per day (2008)</td>
<td>230,137</td>
<td>21,918</td>
<td>252,055</td>
</tr>
<tr>
<td>Commuters between Metropolis and region (2008)</td>
<td>107,600</td>
<td>21,100</td>
<td>128,700</td>
</tr>
</tbody>
</table>
The Scientific Research Centre of the Slovenian Academy of Sciences and Arts (ZRC SAZU) is one of the leading research institutions in Slovenia. Its primary advantage is an interdisciplinary organisation and a diversity of researchers and themes ranging from social and earth sciences to regional planning and humanities. The Anton Melik Geographical Institute of the ZRC SAZU has a wide range of experience in transport planning, and its collaborators have coordinated several projects of national importance.

The Regional Development Agency of the Ljubljana Urban Region provides distinctive and quality projects in the field of regional development along with the necessary information for their effective implementation into citizens’ daily lives. The agency creates development programmes supporting the development of the region as a whole, coordinates regional structural policies and prepares projects for EU funding.
The region

The Province of Rome extends over an area of 5,380 km² and is the most populated province in Italy. Its territory includes 121 municipalities, including the municipality of Rome. The metropolitan area can be subdivided into three concentric rings as follows:

- the City of Rome;
- the extended urban area beyond the Ring Road, including the 38 most dynamic municipalities;
- the outer metropolitan area, a rural area socio-economically connected to the urban core city by employment ties through commuting, with the urban core being the primary labour market.

The density of the first two rings is 1,195 inhabitants/km². From 2002 to 2009 the growth rate of the population of the City of Rome was 7%, while in the surrounding areas it reached 19.6%. 

<table>
<thead>
<tr>
<th></th>
<th>Metropolis</th>
<th>Metropolitan Area</th>
<th>Province of Rome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area in km²</td>
<td>1,308</td>
<td>4,073</td>
<td>5,381</td>
</tr>
<tr>
<td>Number of Inhabitants (2011)</td>
<td>2,761,477</td>
<td>1,432,591</td>
<td>4,194,068</td>
</tr>
<tr>
<td>Inhabitants/km² (2011)</td>
<td>2,112</td>
<td>352</td>
<td>779</td>
</tr>
<tr>
<td>Administrative subdivision</td>
<td>19 district-municipalities</td>
<td>120 municipalities</td>
<td>–</td>
</tr>
<tr>
<td>GDP per capita in Euro (2010)</td>
<td>–</td>
<td>–</td>
<td>32,689</td>
</tr>
<tr>
<td>Cars per 1,000 inhabitants (2010)</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Commuters between Metropolis and metropolitan area (2008)</td>
<td>578,500</td>
<td>260,780</td>
<td>839,280</td>
</tr>
</tbody>
</table>
The partners

The Province of Rome is a second tier local authority in the Italian decentralised system of government, an intermediate authority between the municipalities and the Lazio Region. Its main functions are local planning and zoning, transportation regulation, public employment services and vocational training, and environment. The project was jointly realised by the Office for EU Affairs, the Department for Mobility Governance and Road Safety and the Department for Environment.

The Province of Rome has focused its government action on environmental sustainability policies. Within the framework of an action plan called “Province of Kyoto” seven sustainability challenges have been identified, among them development of alternative energy, land-use planning and sustainable mobility. In 2009 the Province of Rome joined the Covenant of Mayors as a local coordinating body to support municipal governments in developing Sustainable Energy Action Plans (SEAP). 31 municipalities participated in the initiative, and 15 of them approved their SEAP.

The BIC Lazio is a development agency of the Lazio Region, whose main aim is to stimulate the creation of new companies, accompanying them from the phase of start-up, and in some cases hosting them in incubators located throughout the regional territory. Moreover, BIC Lazio has extensive experience in EU programmes, enriching its know-how on local development.

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In Metropolitan Regions, where the density and diversity of human activities are potentially highest, development patterns shape the environment like few other factors. The natural settings and human activities influence the character of development patterns. At the same time, the resulting structures are the framework for people’s activities and therefore have a strong influence on them. As a result, the activities and structures are interdependent.

Historically, technological developments in the area of transport and communication have radically changed development patterns. Examples are the introduction of railways and trams and, later, the boom in private cars. With the new mobility, people’s settlement preferences changed. Often this meant moving to less densely built-up environments. Dispersed development patterns linked by infrastructure for motorised transport are often a result of this development, in short: urban sprawl. However, the negative effects of increased traffic have made some settlements less attractive. Dispersed development patterns lead to larger distances between activities, so that people have no choice but to use motorised transport, in many cases, cars. In the absence of regulatory control this vicious circle creates and recreates urban sprawl.

As institutions acting in the interest of society, public bodies can choose to regulate spatial growth. This is mainly based on land-use planning and constitutes one possible initiative against the vicious circle of urban sprawl and increasing traffic volumes, and may lead to more sustainability.

Economic development is linked to freedom of movement for people and goods in many ways. People also expect to have good access to the social and cultural benefits of modern life, which in most cases requires a high degree of mobility. Limitations on mobility could constrain economic and social activities, so this could be perceived as problematic. This also explains why the principle that “curbing mobility is not an option” has been adopted by the European Commission in the White Paper on transport (Roadmap ... 2011).

Therefore the aim has to be the reduction of unsustainable traffic without reducing accessibility. This may be done by avoiding the need for (motorised) transport, or by offering alternative, sustainable transport forms. In the view of the partners in Catch-MR, dense development patterns appear to be a prerequisite for sustainable forms of mobility. This principle has also been formally put forward in the Leipzig Charter (2007) in the context of an efficient and sustainable use of resources by the EU member state ministers responsible for urban development. It is accepted that land-use planning is an instrument which must be used to achieve this. Therefore, land-use planning is a key issue in a project on transportation.

While transport policy instruments address transport challenges directly, land-use policy affects the framework and influences traffic indirectly. Planners are thus frequently challenged by a “chicken-or-the-egg” problem: should we increase the sustainability of transport first by land-use planning measures or by transport measures? From a systemic perspective, land use and transport are subsystems of cities and settlements at a regional level. When influencing one subsystem the other is affected as well. Approaches limited to one sector may not always have an optimal effect on the other, e.g. if transport planners optimise infrastructure to allow a good level of service and land-use planners only focus on development at all costs, the implications of their activities on each other may
be missed. In a modern approach, integrated thinking and a coordinated approach are essential. Based on this approach, strong and effective action can be taken in both subsystems at the same time to increase the overall sustainability of Metropolitan Regions.

Land-use planning, in the case of this project, is understood in a context that goes beyond zoning and the building code and includes strategic plans for development of large areas or regions over long timescales, or also the promotion and development of major projects at specific locations. As functions in Metropolitan Regions do not usually stop at administrative boundaries, a cooperative approach to land-use planning should be developed which includes all affected stakeholders. The partners in Catch-MR have aimed at investigating these issues in the seven participating Metropolitan Regions and making general recommendations that may be considered by other regions.

This chapter has three parts: Following a brief general overview of the drivers and extent of urban sprawl, the manifestations of urban sprawl in the seven Metropolitan Regions of the Catch-MR project are described. Planning solutions which may help to address urban sprawl are then presented and illustrated with examples which have been successful. As a conclusion the main insights are summed up, listing key factors for sustainable development through coordinated land-use and transport planning.

2.1 People and local conditions:
The picture of urban sprawl in the analysed Metropolitan Regions

Market actors, public authorities and resident citizens drive the development of settlement patterns. Local conditions provide the background context, and constitute an important influence. To learn about development processes in the Metropolitan Regions and their results, people’s activities, interests and the specific context all have to be understood. To create awareness and a common understanding of these factors, different perspectives must be taken into account.

Understanding the driving forces of urban sprawl is an important step towards effective planning strategies. The discussion should involve stakeholders and decision-makers. The following questions suggest a way to progress from a common perception of the problem to a joint understanding of necessary activities:

• What can planners in Metropolitan Regions learn from the given situation of urban sprawl?
• Which of the drivers of urban sprawl can be influenced by actions of planners, and how can they be influenced?

An overview of the phenomenon of urban sprawl is presented in the following before the individual cases of the Metropolitan Regions of the project are analysed further. It is based on the findings of Christiansen and Loftsgarden (2011) and Engebretsen and Christiansen (2011) and is discussed together with participants’ views that were expressed at Catch-MR workshops in Gothenburg (June 2010) and Vienna (October 2010).

The following dimensions were defined for the analysis in a study on the drivers of urban sprawl in Europe funded within the Catch-MR project (Christiansen and Loftsgarden 2011):

• economy;
• societal factors/community;
• transportation;
• policy and regulatory framework.

Internationally, there is no common definition of urban sprawl. Most generally, it is the process and the result of rapid, low-density outward expansion of cities. Developments stimulated by industrialisation in the 19th century may be considered as incidences of urban sprawl, but today’s challenges originated mainly in the 20th century. In that period, urban
sprawl was mostly driven by citizens’ preferences for detached houses with gardens, which was made possible by increasing wealth, private cars and the required infrastructure. Today, urban sprawl is usually associated with unplanned or unsuccessfully planned urban development. It is characterised by low-density land uses within urban agglomerations and at the urban fringe. The phenomenon is now generally considered to have negative environmental, social and economic impacts for both cities and the countryside.

Many European cities are continuing to expand spatially by urban sprawl. Cities situated close to each other sometimes even become knitted together as their suburbs develop towards each other and merge into a single agglomeration. Urban sprawl is a long-term process of changing land-use patterns, often starting with a compact and dense core which is further developed with widespread low-density patterns. Urban sprawl makes citizens dependent on cars to access jobs, services, culture and their social networks. There is clear evidence to show that development patterns, i.e. the location and density of housing, services and employment, have a strong influence on how people travel and how often they have to travel. People who live in high-density areas use their cars significantly less than those who live in low-density areas. Also, people who work and shop in central locations use their cars significantly less than those who work and shop in areas outside the main centres (Engebretsen and Christiansen 2011).

Large areas of urban sprawl create large volumes of traffic. This has negative impacts, both socially and environmentally, but also indirectly, economically:

- Quality of life, including health, is affected by increased air pollution and noise.
- Growing demand for energy (e.g. fuels) and water leads to increased exploitation of the environment, often in unsustainable ways.
- When natural and rural environments are used for transport infrastructure and settlements, this is often associated with loss of biodiversity. Sometimes even protected areas are affected by consumption of soil and land, even if only indirectly.
- Low-density settlements inhibit efficiency. Providing transport infrastructure and services becomes more costly per capita, since only few people have easy access. This can go as far as a situation where keeping up certain public transportation services is no longer economically possible, due to the subsidy needed to compensate for low passenger numbers. Consequently people may be forced to rely on more unsustainable car traffic.
- Important socio-economic impacts of sprawl are the increase of segregation, meaning the increasing spatial division of society according to socio-economic characteristics.

The impact of urban sprawl on competitiveness and sustainability is also recognised at the European level. As cities play a key role in European development it is agreed that key principles of future European urban and territorial development should be characterised by, among other things, a compact settlement structure with limited urban sprawl (Cities ... 2011, VI).

At the same time, urban sprawl is a phenomenon within an open market for development and, as such, is a manifestation of citizens’ preferences. In general, individual preferences should be respected as far as possible. However, the problematic consequences of urban sprawl require special attention. Planning should seek to counter the negative effects, so that they are not a burden to society, the economy or to the environment. A particular challenge in a complex Metropolitan Region is to encourage locally sustainable development within different parts of the Metropolitan Region while at the same time ensuring sustainable mobility between the various locations across the region as a whole.

2.1.1 Common issues regarding urban sprawl in the Metropolitan Regions of Catch-MR

Although the seven participating Metropolitan Regions differ in a number of ways, important similarities concerning urban sprawl have been identified. Developments in both traffic and land-use patterns and recent lessons related to urban sprawl have been reviewed. Amongst the similarities, the following aspects were found to be the most important when describing and attempting to explain urban sprawl:

- Quality of life in terms of household size (m² and persons per household) and accessibility is a key
factor for the choice of the housing location. Data for some of the partners in the past decade or two suggests a trend where the number of single households increased strongly in core cities, while the average living space grew faster in the surrounding regions. This is a result of differing demands. Students and DINKs (double income no kids) often prefer the greater ease of accessibility in centres. Families often favour a house with a garden. The high population density of city centres might also appear as a problem for families and is therefore considered a push-factor for moving to the urban periphery.

- Overall mobility-related costs in the regions are generally higher than in the core cities. This is balanced against higher housing costs in more central locations. These cost categories and the perceived benefits influence people’s choice between living centrally or leaving the city. While housing costs appear to be a major issue of concern to households, practitioners in planning do not monitor an especially high sensitivity to mobility costs when choosing a living location. This fact often seems to be outweighed by other drivers such as the ones listed above and below. Developments such as increasing fuel prices or measures leading to an increasing internalisation of the negative external effects of motorised traffic may change this in the future. In the medium and long term this could strongly affect land-use patterns and thus the development of Metropolitan Regions.

- In the seven Metropolitan Regions of Catch-MR the main drivers of urban sprawl are land prices, improved accessibility and people’s fondness for cars. Neither imbalance of power between core cities and surrounding regions nor uncoordinated development appear to be significant drivers of sprawl. However, in Metropolitan Regions where there is no joint vision or joint regional planning, there is little to prevent sprawling development.

- In all the Metropolitan Regions except Oslo-Akershus, urban sprawl in the outer region was registered as being much stronger than growth in the core city. In Vienna and Ljubljana, growth in the region was additionally, in some parts, driven by relocation of urban functions to the region. This phenomenon can be assessed differently, as a situation in which urban functions do not follow residents may lead to even greater mobility needs and thus traffic volumes. In such cases it is important to look at the specific characteristics of the development to determine whether it implies positive or negative consequences.

- Unfortunately, planners do not feel that they have been very successful so far in counteracting sprawl or in reducing its negative effects. Only Gothenburg and Berlin seemed to be relatively satisfied with their existing policies and governance structures.

An overview of the participants’ own assessments of drivers of sprawl in their respective Metropolitan Regions is shown in figure 2.1.
2.1.2 Manifestations of land-use and traffic patterns in the Metropolitan Regions of Catch-MR

**Demography, social aspects, economics**

The variation between the cheapest and highest prices for building land is very large in the Metropolitan Regions, both regarding the internal price range, and in a comparison between regions. Even if the currency and purchasing power differences are considered, the maximum difference lies between less than 10 Euro/m² and more than 2,000 Euro/m² (figures reported by planners from the respective regions in 2010 based on the most recent available local statistics). In general, Rome represents a class of its own due to its extremely high land prices in the centre, while the dynamic of changes in Budapest and Ljubljana has led to a very wide price range especially between periphery and core city.

Generally the average living space per capita (m²/capita) appears to have grown much faster in the regions than in the Metropolises. The Vienna Region has the highest value (41 m²/capita in 2008), and the Ljubljana Region the lowest (24 m²/capita in 1998, growing to 31 m²/capita in 2008). The change in Rome Metropolis was much smaller, increasing from 25 m²/capita in 1998 to 28 m²/capita in 2008.

The average number of persons per household decreased over the same period. Although the figures vary, the average is about 2.3 persons per household in 2008, with the lowest value in Berlin Metropolis (1.8 in 2008) and the maximum in the Ljubljana Region (3.3 in 1991, but still 3 in 2002). These trends are anticipated to continue in the population forecasts. Generally, the regions are expected to grow faster than the core cities. Some of the city centres will even shrink: the forecasts so far assume that the Metropolises of Budapest and Ljubljana will lose inhabitants, while Rome, Gothenburg, Berlin and Vienna will grow slightly. For Oslo and Akershus, strong growth has been registered across the whole region in recent years and is expected to continue in the foreseeable future.

Looking at the share of immigrants and their distribution in all the Metropolitan Regions, interesting situations were described by experts in the project's workshops. With the exception of Rome, the share of immigrants was found to always be higher in the Metropolis than in the region. The large numbers of immigrant populations in the region outside Rome Metropolis are partly attributed to the extremely high land prices in the centre.

All circles represent only the area sizes in km² of the metropolises (red) and its region (green). They are in no way proportional to any population values. For exact figures of sizes and populations, see left (table and chart).
In Gothenburg a segregation phenomenon was described whereby high proportions of immigrants in a district motivate previous inhabitants (traditionally Swedes) to migrate to another part of the Metropolitan Region. Apart from the segregation effects, this may be considered a push-factor for urban sprawl, thus illustrating the complexity and potential effects of changes in the social environments in Metropolitan Regions.

**Mobility and transport**

Most of the partners in Catch-MR concurred that the scattered settlement structure outside Metropolises impedes efficient and competitive public transport; this was especially highlighted by representatives from Rome and Gothenburg. At the same time, many residents appear to have clear preferences for private car usage. The combination of migratory patterns towards low-density areas and a preference for using cars leads to a major dilemma: On the one hand it will be inefficient to provide public transport in low-density areas because of the high cost per capita. On the other hand, without very good public transport, it will not be possible to convince people with a preference for travelling in cars to use this more sustainable mode of transportation. Public transport has been improved in all of the analysed Metropolitan Regions in the past years, with the exception of Budapest and Ljubljana. Still, it is often perceived that the public transport system in its current state is still far from being an attractive alternative to private car use. The continuation of this development is alarming. Given that public funds have to be spent with great care, expansion of public transport services at all costs will not be possible. Therefore it is necessary to take action on other levels as well, such as restrictive measures for car traffic (see also chapter 3) and stronger consistency of land-use planning.

A vicious circle which is a threat to the sustainable development of transport in general was dramatically illustrated in a statement by experts from Ljubljana: suburban areas are particularly car oriented. The supply of public transportation has practically not changed or has worsened in the periphery, yet these areas have grown significantly. Due to the lack of adequate supply of public transportation in suburban settlements, fewer people use it. Because it is difficult to maintain a public transport supply where there is no demand, public transportation services are curbed. As a result, the research done in the Ljubljana Region shows that public transportation is only competitive in a few settlements, such as Litija and Borovnica. Newer settlements that have grown in the last two decades are virtually unserviced by public transport. In Ljubljana Metropolis, the public transportation system is well organised, yet it is also losing passengers rapidly. It mostly serves only those segments of the population which are not able or allowed to drive cars such as young people or elderly people. Finally this may create an image which is unattractive for some people. This again might lead to a further drop in ridership – and consequently services. This example may be viewed as a warning to all Metropolitan Regions, reinforcing the need to take action to avoid such a vicious circle.

**Environmental impacts**

Until the late 20th century, negative environmental impacts of transport were often not considered a major problem. In the past decades this factor has received increasing attention. Exchange of facts and figures on the incidence of environmental impacts shows a diverse picture. In Gothenburg and Oslo, for example, there has been no significant loss of protected natural sites. The cities of Berlin, Vienna and Ljubljana reported some loss of agricultural and forest areas, but only a marginal amount. In contrast, in the peripheral parts of some Metropolitan Regions, urban sprawl has consumed large agricultural and forest areas. Examples are the Budapest Region, where 8,060 ha of green space were developed between 2000 and 2007, and the region around Berlin, with 5,910 ha.

Experts from Gothenburg provided the following practical example from the peripheral parts of the Metropolitan Region (cited from a project questionnaire):

> “Houses planned for summer and weekend use are generally not connected to the sewage system, and are now increasingly being transformed into permanent housing, though still not connected to the technical systems. This may lead to contamination of land and ground water. The sprawl is associated with increased private car use, causing noise and air pollution. The car use has also required extensions of the road system creating barriers in the nature areas and consuming land.”
Institutional framework and policy responses

Except for Berlin and to some extent Gothenburg, participants from all the Metropolitan Regions recognised that there was a lack of effective regulation power at the regional level to influence local municipalities. Cross-border coordination in economic development is also rather weak in the Metropolitan Regions, except for Oslo and Gothenburg. Regarding the development of residential areas and business parks, the “the-cheapest-gets-it-all-principle” appears to be true for Budapest, Rome, Vienna and Ljubljana. This means that there is significant competition between municipalities to attract businesses and residents. The municipality offering the highest subsidies, lowest taxes or best benefits is the most attractive. This pressures municipalities to use regulative instruments in a very liberal manner. In the long term this may also lead to a depletion of public funds. To avoid this situation of competition, cooperation between the municipalities is essential. Participants from Berlin and Ljubljana could inform the other participants that on-going projects with the potential to control urban sprawl exist. These concrete projects are being conducted jointly between the Metropolis and the Region.

In addition to joint projects, cooperation may be facilitated by various kinds of common institutions for planning. All the Metropolitan Regions in Catch-MR have such an institution of one kind or another. However, only in Gothenburg, Berlin and partially in Vienna are these institutions felt to be successful in stopping or at least reducing urban sprawl in the future. Facing this situation, some participants had more faith in changes in tax systems and subsidised schemes being able to contribute to containing the sprawl. This includes changes in the financial treatment of private car use and commuting, which could be a promising trigger. If implemented, this would be a significant policy change towards sustainability. At the same time it demonstrates that the potentials which integrated cooperative planning can offer are not activated in most of the Metropolitan Regions. There is insufficient capitalisation on an important area of action.

2.1.3 Urban sprawl: Common insights

The main facilitators and drivers of urban sprawl in the Metropolitan Regions are the structure of land prices, improvement of accessibility and the citizens’ preference for using cars. These drivers have to be seen in the context of the wish of every person to optimise his or her quality of life and personal preferences. Also it must be recognised that people seem to perceive costs differently, depending on how they occur. Based on this, the conclusion is that as long as there is a continuing increase and improvement of the infrastructure for commuting by car, urban sprawl is likely to continue. In general, the analysis showed that the pull-factors are slightly more important drivers of urban sprawl in Metropolitan Regions than the push-factors.

Technically, the following strategic approaches should be considered in order to combat urban sprawl: providing a polycentric (public) transport system that covers the different functional areas of a Metropolitan Region is of importance. The densification of specific centres in the Metropolitan Regions has to be combined with the development and protection of the green structure to maintain these places as attractive residential areas. Increased investment in regional public transport infrastructures and services could make traffic caused by urban sprawl more sustainable. This instrument should be complemented by measures to restrict car traffic in centres. At the same time, the structure of public transport may lead to more sustainably organised settlements in the future compared to car-oriented structures.

The question of which drivers of urban sprawl can be influenced by the actions of planners, and how they
may be influenced, is more difficult to answer. The approach presented here is divided into supply and demand issues.

• Planning can directly influence urban sprawl drivers on the “supply side” by the way infrastructure and transport services are provided and land use is managed. The preconditions for further developments are set, influencing the speed of development and the order in which sites are built. Planning for compact development that integrates concepts for sustainable transport can help to limit local travel needs, prevent urban sprawl and increase sustainability. Car traffic and its negative effects may be reduced. If planning is not coordinated, stakeholders may have the possibility to evade restrictions or transport infrastructures might be provided inefficiently. Coordination in a Metropolitan Region is the foundation of the consistency of plans in the long term.

For many Metropolitan Regions a dialogue with the national level will be necessary. Legislation and fiscal equalisation schemes often have a huge impact on the incentives for stakeholders in Metropolitan Regions to cooperate. If competition is inspired rather than cooperation, the consequence may be dispersed settlements and the associated transport, social and environmental problems.

• The demand side depends mostly on personal preferences of citizens and is much more difficult to influence. This is especially true for local public bodies but also for regional administrations as they have no or only limited possibilities to influence the most relevant instrument: fiscal policy. In this respect the different levels of government have to work together. Involvement of the national level is crucial.

A second field of public activity is educative measures and raising awareness. While sensitisation is very important, effects are very difficult to measure or relate to the particular initiatives. Also, they may only occur in the long term. Creation of a broader understanding of mobility behaviour and land-use patterns may be achieved by providing targeted information or involvement in planning processes. Seen as a whole, good structures for cooperation between public administrations and for the involvement of stakeholders and citizens are needed. Thus a shared vision of the development of a Metropolitan Region may be created, including sustainable mobility. Cooperation is the only way to achieve this, but there are different governance structures leading to cooperation.

► 2.2 Regional vision and governance: Cooperatively planning Metropolitan Regions

As one emphasis of the project, Catch-MR focused on cooperation as a strategy and a key issue in land-use and transport planning. Success and failure are shaped by certain features of the cooperation in question. Among other things, these characteristics determine the ability of the cooperation framework to motivate actors. Also they influence the potential of the cooperation to support the involved actors in reaching consensus in different phases of policy-making (agenda setting, decision-making, implementation; these activities may be related either to the development and implementation of concrete projects or to more general strategic goals). The main questions were:

• How can the coordination between land-use and traffic planning be improved at the level of Metropolitan Regions in order to achieve the goals of sustainable development?

• How can different types of metropolitan governance (in particular: cooperative approaches) contribute to a better coordination between land-use and traffic planning?

Three different ways of cooperating are presented in more detail in the following. In addition to a descriptive text, the strengths and weaknesses of these types of cooperation are analysed and presented in a structured way. The evaluation always considers the regional and local conditions of the specific good practice case.

These cooperation frameworks have been established in the analysed Metropolitan Regions and were assessed as good models by the project partners: informal metropolitan cooperation, associated cooperation between municipalities and cooperation between regions. A broader perspective on governance is given in chapter 5.
2.2.1 Informal metropolitan cooperation: Metropolitan Area Management Vienna-Lower Austria

A number of different approaches to informal metropolitan cooperation can be identified in the seven analysed Metropolitan Regions in Catch-MR. These initiatives form the primary basis for dialogues concerning city-regional development among a wide range of participating actors. As an indirect instrument of planning, stakeholders can establish municipal platforms for voluntary cooperation in the core areas of Metropolitan Regions, as it is the case for the Metropolitan Area Management Vienna-Lower Austria (Stadt Umland Management – SUM). Institutionalised in 2006, SUM is a rather young joint initiative of the provinces of Vienna and Lower Austria on their way towards cross-border cooperation along the border.

The general finding of Catch-MR was that such informal metropolitan cooperation is often an early catalyst for communication and exchange on problems and challenges in the region. The need for common solutions is an important motivator to engage in such a form of cooperation. Stakeholders are often highly motivated to join the process due to the open and voluntary character of the setting, and there is an additional convincing factor as there are already stories of success. Creative solutions can be developed without formal restrictions. Informal metropolitan cooperation provides mutual information, and even small municipal administrations get access to expertise and good practice know-how.

On the other hand, this type of cooperation apparently lacks “real” influence, especially when no bottom-up culture has developed which fosters participation in the application of planning instruments. Being bound to different planning laws (e.g. Lower Austria and Vienna) does not stimulate cooperation. The informal cooperation has no planning authority, nor a legal status. For the process of cooperation it is also a significant problem if representatives of large municipalities are not willing to commit to joint decisions which may mean that they have to share part of their power.

Informal cooperation is based on common interests and consensus. Raising awareness about the impacts of regional development is fundamental to reaching a consensus between all actors involved. The main element here is the process of building trust. A structured environment for discussion can already help a lot in this context. Actors have to listen to...
each other’s opinions respectfully even if they do not agree. As a consequence, this kind of cooperation takes time. Common understanding is seen as a strength of informal metropolitan cooperation. In some cases, results are even achieved by group pressure.

The informal and voluntary character is both a strong and a weak point at the same time. This becomes obvious in the case of conflicts, when reliable decisions have to be taken. The cooperation process is threatened by the competition between municipalities and other destabilising factors, like the disharmonious chorus of too many voices, a difficult economic situation, changing responsibilities among politicians, etc. The greater the number of stakeholders (communities and mayors) in the region and the more complex the legal framework, the more difficult it becomes. Especially then it becomes a real challenge to bring all interested actors and competent authorities together on a voluntary basis. There are no instruments inherent to the informal cooperation to force stakeholders to cooperate (e.g. funding mechanisms to develop cooperative projects). In some cases instruments from external frameworks may be involved, depending on the situation.

In general, informal metropolitan cooperation is a good framework to coordinate initiatives coming from the local level. In addition it can help to settle conflicts in an uncomplicated setting, or even prevent them through good communication. The interests of local stakeholders make this form of cooperation possible.

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<th>Informal metropolitan cooperation</th>
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<td>► Strengths</td>
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<tr>
<td>… in terms of motivating actors and institutions to cooperate</td>
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<tr>
<td>- Exchange of information;</td>
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<td>- Providing of expertise;</td>
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<tr>
<td>- Managing of larger projects together;</td>
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<tr>
<td>- Multiplied creativity;</td>
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<td>- Self-motivation based on success stories.</td>
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| … in terms of reaching consensus between all involved actors in the policy fields of regional planning | |
| - Catalyst in case of problems; | - Time consuming process, too many voices; |
| - Building of trust and common understanding. | - Competition between municipalities; |
|                                                                 | - Heterogeneous group of actors. |

Table 2.1: Summary of the strengths and weaknesses of the informal metropolitan cooperation approach.
2.2.2 Metropolitan association with an organisational core: Gothenburg Region Association of Local Authorities

Cooperative alliances of municipalities and regional administrative units in Metropolitan Regions are another approach to solving the problems of urban sprawl in a complex environment. The Gothenburg Region Association of Local Authorities (GR) was chosen as one good practice example of a formal cooperation between municipalities. Traditionally in Sweden’s political culture, problems have been solved in dialogues between a range of political actors and between state and corporatist institutions in a very pragmatic manner.

The GR, one of four regional associations of local authorities in the Region Västra-Götaland, consists of 13 member municipalities and is the central planning authority in the region. It is based on a relatively long tradition of regional planning in the Gothenburg Region, dating back to the 1940s, when the first regional plan (structural plan for the region) was developed. The Gothenburg Region has adapted its long tradition of regional planning to the new needs of regional development with a shift from detailed regional plans produced every second decade towards comprehensive planning, regional governance, agreements, a holistic approach and participation. Formal cooperation between municipalities is one of the key instruments within this important transformation and brings a lot of advantages to a Metropolitan Region, as the example of the GR shows.

One of the most important qualities of the GR is its function as a common board for cooperation and communication. It is considered a motivation for all involved actors that a board is speaking for the region, in contrast to each municipality attempting to place its individual interests as prominently as possible. Even though the municipalities transfer part of their power to the regional collective and thus to the majority of interests of all represented stakeholders, the whole region finds itself in a stronger position in the competition with other regions (such as Stockholm or Malmö). Even if this form of cooperation seems to be only slightly different from informal ones, the

Specific qualities:
- work in many different sectors: e.g. regional planning, environment, traffic, labour market, welfare and social services, capacity-building and research;
- municipalities in a region request cooperation to get stronger together;
- establishes connection between the local and the national level.

Results:
The municipalities now share an understanding of the need for integrated transport and land-use planning. They also see the benefits of working together to create a regional picture and thereby taking joint responsibility for a sustainable regional structure and regional growth. Approximately 8,000 politicians and civil servants participate every year in the GR’s courses and conferences.
common board makes it much easier to deal with local mentalities, stimulate cooperation and reach consensus. It’s motivating for all to see that political differences, for example between the Metropolis and the surrounding Region, do not make regional cooperation impossible. Also, the example of the GR shows that professional politicians obviously have more resources to get involved in regional cooperation than those engaged as part-time professionals. A systemic advantage in this case is that the national level plays an important role in the process of developing plans and financing projects. A strong cooperation between municipalities and a common forum helps to create a good connection between the local and the national level. It helps the state in making good decisions and formulating strategies that are well accepted by smaller institutions.

In spite of these strong points, cooperation between municipalities is vulnerable to external influences. A stable consensus of the members is required, even if it is only a minimum. The ability to reach such a consensus is weakened in situations with increased competition between stakeholders. Market pressure can interfere with existing agreements even if they were reached cooperatively. There are no instruments to force municipalities to align themselves with a position against their will. This kind of cooperation is based on the freedom of choice. The framework for cooperation seems to be far from everyday decision-making in this respect, being a rather informal discussion in accordance with joint regional decisions. Another bone of contention is the lack of influence on revenues of a formal metropolitan cooperation, when there are no separate taxes.

To reach a consensus between the actors involved in the region, it is crucial which problems are addressed in regional planning. Due to the strong ownership by the municipalities, they primarily put local problems and their own objectives on the agenda. This is an advantage of this cooperation, also because problems can be identified at an early stage. Moreover, the parties involved are committed to the fact that it is better to reach a consensus even if it is not a perfect one. Involving local municipalities is a time consuming affair: Each municipality develops their own ideas first, which are presented at round tables. Afterwards the ideas are integrated during a period of preparation to create a common and quite general strategy. This may take up to five years. It would have been quicker to draw up another regional plan in 2001 but that was seen as rather ineffective as the GR relies on a weak governance status (even though it is a formal cooperation). Instead of prescribing a
certain vision for regional development, the new strategy is to move from common insight to common action. The Gothenburg experience has proven to be an effective way in regional development of creating common understanding and trust within the local municipalities.

The example of the GR shows that it is an advantage to operate with different departments in one organisation and to face problems with a multispectral responsibility (e.g. various incentives). This multi-sectoral responsibility is a practical example of integrated planning. A metropolitan association such as the GR is able to deal with a wide range of topics and provide instruments for regional planning. It makes cooperation more flexible. However, this type of cooperation runs the risk of avoiding difficult questions. In particular, more complex issues depend on single initiatives rather than common goals in regional planning. The two following examples illustrate challenges between the regional and the national level: immigration policy and the construction of a four-lane motorway in the region. The legal framework at the local level (administrative country board) ensures that the legislation is established with the background that building new houses is supported and standards like maximum noise levels, water provision, or requirements of neighbours are considered in the process. But it is more difficult to consider the combined effects for the whole region at this level (e.g. regional energy consumption with regard to climate change). The importance of cooperation between municipalities in Metropolitan Regions can be distinctively promoted with the support of relevant stakeholders like general associations of municipalities and other principal actors at the national level.

### Metropolitan association with an organisational core

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<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<td>- A board speaks for the region;</td>
<td>- Time consuming process;</td>
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<td>- Supports the national level;</td>
<td>- Depends on cultural traditions of country.</td>
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<td>- Local problems put on the agenda for regional discussion;</td>
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<td>- Clear financing structures.</td>
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<th>… in terms of reaching consensus between all involved actors in the policy fields of regional planning</th>
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<td>- Acts as “regional coach”;</td>
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<td>- Clear structure for discussion and planning;</td>
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<td>- Clear mandate for decision-making;</td>
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<td>- A cultivated continuous process.</td>
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Table 2.2: Strengths and weaknesses of a metropolitan association with an organisational core.
2.2.3 Formal cooperation between regions:
Joint Spatial Planning Department Berlin-Brandenburg

Only few of the seven Metropolitan Regions in the project have established formalised planning authorities, legitimised by public law, on a regional level. One example is the Capital Region Berlin-Brandenburg with its Joint Spatial Planning Department Berlin-Brandenburg (Gemeinsame Landesplanungsabteilung – GL). The identification of common problems and clear goals in an explicit legal framework provides a strong motivation for actors and institutions to cooperate. A formal cooperation between regions can successfully establish a strong planning system which allows strict control of local measures. Compliance with the overall objectives and rules is facilitated.

The fact that there is only one spatial planning entity was identified as a strength by experts from the project partners. Still, the question remains regarding integration of local interests. The still very formalised top-down planning process leads quite often – especially in smaller municipalities – to a low level of identification with the region. Although the joint department in the recent past has started to organise informal processes (e.g. airport), the approach may seem quite mechanistic and inflexible. On the other hand, it does prevent, or at least contain, unsustainable developments like uncontrolled suburbanisation or the building of large-scale retail centres without good access by sustainable transport modes.

**JOINT SPATIAL PLANNING DEPARTMENT BERLIN-BRANDENBURG (GL)**

**Number of partners involved:** 2 Federal States.

**Objective:**
- provision of a consistent planning framework;
- to limit urban sprawl, concentrate development in defined cores and axes, protect green areas and reduce the need for (motorised) transport.

Department Berlin-Brandenburg (Gemeinsame Landesplanungsabteilung – GL). The identification of common problems and clear goals in an explicit legal framework provides a strong motivation for actors and institutions to cooperate. A formal cooperation between regions can successfully establish a strong planning system which allows strict control of local measures. Compliance with the overall objectives and rules is facilitated.

In the example of Berlin-Brandenburg the regional perspective (here referring to spatial planning at the state level) is a dominant factor, imposed by the joint planning department. In this context reaching a consensus means that the regional plan (here referring to the State Development Plan Berlin-Brandenburg (Landesentwicklungsplan ... 2009; LEP B-B) aims at setting the rules for municipalities in order to secure a sustainable development of the whole Capital Region. The LEP B-B concentrates development at existing settlement cores, along axes and in places with a certain level of centrality. Thus green areas are protected, urban sprawl is contained, and the need for transport is reduced. Smaller, non-central towns are unrestricted when it comes to using spaces within the existing settlement.

**Specific qualities:**
- federal state authority responsible for two federal states in the area of regional development;
- formalised planning process;
- solid staffing, long-term secured financing and strong support by politics.

**Results:**
Predictable (investment) conditions, irrespective of administrative borders, are provided in the whole Metropolitan Region. The GL creates a reliable framework for the development of rules and procedures and it is able to support new challenges (e.g. demographic change, energy turnaround). A success is the fact that uncontrolled urban sprawl around the Metropolis has been confined. Inappropriate development projects (e.g. large retail centres at unsuitable locations) have been prevented.
structures. However, the possibilities for green field developments are limited (0.5 ha/1,000 inhabitants in 10 years).

While the top-down principle offers a powerful framework for cooperation, local stakeholders have the freedom for proper activities due to clear rules and monitoring of the achievement of high-level objectives. The monitoring is implemented by controlling indicators and figures. This leads to predictable investment conditions. Periodic revisions of the LEP B-B are planned. The cooperation between land-use and transport planning is partly one-sided when national or European transport planning is a given parameter for spatial planning. In the case of Berlin-Brandenburg this is the Federal Transport Infrastructure Plan (Bundesverkehrswegeplan 2003) covering federal trunk roads, railways and waterways.

The overall opinion of the Catch-MR project partners was a positive acknowledgement of the strong formal framework and the corresponding legal basis between different levels of administration, as described. The example shows that well-structured implementation of long term planning goals can be achieved through accepting strict planning rules and laws. Regional planning at the level of states or provinces is less likely to be influenced by private investment interests than planning at a local level. For the long term this can lead to a better result for the region as a whole. If the cooperation is implemented in a joint regional planning department, the goals justify the fact that some opinions have to be neglected in the interest of overall sustainable development. Nevertheless, the majority of the participants critically pointed out that involving people in this kind of regional planning is often an underestimated factor of success. The participants agreed that there is a clear need for more informal discussions with all actors and at all levels – in short: there is a need for more communication.

### 2.3 Lessons learned: Key factors for sustainable development of land use and transport

Metropolitan Regions are characterised by a high number and great variety of actors and interests. To achieve sustainable development in the economic, social and ecologic dimensions, coordinated and integrated action is necessary. Cooperation between

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**Table 2.3: Strengths and weaknesses of formal cooperation between regions.**

<table>
<thead>
<tr>
<th><strong>Formal cooperation between regions</strong></th>
<th><strong>Strengths</strong></th>
<th><strong>Weaknesses</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>… in terms of motivating actors and institutions to cooperate</td>
<td>- Identification of common problems and clear goals in an explicit legal framework; - Strict and strong planning system; - Local stakeholders can gain freedom in their activities due to clear rules; - Achievement of long term-planning goals.</td>
<td>- Low level of identification with the region in smaller settlements in the surrounding area; - Lack of communication with lower governmental levels.</td>
</tr>
<tr>
<td>… in terms of reaching consensus between all involved actors in the policy fields of regional planning</td>
<td>- Only one spatial planning entity; - Less market influence than with planning at local level.</td>
<td>- Automatic, rigid and inflexible approach; - Need for more communication.</td>
</tr>
</tbody>
</table>
different institutions of government can facilitate this. A joint approach is often difficult within an administrative region. The challenge is even greater if institutions and elected bodies separated by administrative borders are working together. This is often the case in Metropolitan Regions. Many Metropolitan Regions have to cope with weak institutionalisation and a lack of formal planning instruments at the regional level. In addition there is an eminent potential for conflicts due to the different interests of constituents which the respective administrative bodies represent. Still the best solution for the Metropolitan Region as a whole must be sought. The few existing legal instruments have to be complemented by other, more communicative instruments in order to coordinate different political and specialist arguments.

There is a variety of influences on regional development of land use and transport. The following key factors have been identified as important for achieving sustainable development of land use and traffic:

### Regional vision for land-use and transport policy

Metropolitan Regions should establish a common vision for development which is not limited to administrative borders but includes all parts of the functional region. This vision must be shared by the relevant stakeholders and authorities. It creates an understanding of how to bring together regions and core cities and how to combine measures in different sectors. Based on this, coherent goals can be defined. Strategies for development must include both land-use and transport planning, reflecting a higher, integrated planning culture. By believing in the vision and embodying it, priorities and decisions in land-use and transport planning will fall in line with and lead to coordinated efforts in implementation.

### Governance as a means of working together

Governance means cooperation between actors in the region, in ways that increase involvement and cut through formal administrative barriers and tiers of government, without replacing the basis of elected government and allocating resources. With good governance, there is a greater chance that joint land-use and transportation policies can be developed within a common vision. Implementation can be achieved through broad dialogue, sharing the vision with stakeholders, so it becomes adapted as the basis for participating organisations. Governance is about managing power and policy. In regional development, governance should seek to bind the Metropolitan Region together. Governance might be informal or formal to different degrees, so that sustainable action in Metropolitan Regions becomes stimulated. In any case the responsibility must be taken seriously independent of the level of governance.

### People must be involved

Individuals as well as different groups of people influence the regional development of land use and transport through their choices and actions. What people believe, say and do is also in constant change. What planners think is best for citizens is often not what people themselves want. Therefore, citizens, companies, interest groups, politicians and the administration should all have a say in participatory planning. A Metropolitan Region is a complex arena. To reach a regional consensus it is vital to find ways to communicate with citizens about the regional issues and vision. This includes motivating sustainable behaviour, for example by raising awareness, providing incentives or modifying conditions.

### Local conditions

Another factor that constitutes the basis for integrated land-use and transport planning is local conditions such as specific landscapes, the local composition of society, historic heritages, or characteristics of the natural environment. This partly explains why different regions have adopted different approaches, in accordance with their distinctiveness. The specific local conditions call for adapted planning solutions. The action of politics and administration at the local and regional levels has certain limitations. Significant regulation guiding the activities of stakeholders in Metropolitan Regions is determined by national or European law. Land-use planning and transport planning to a large extent remain a competence at the local and regional levels. Hence this is one of the most important fields of action for government bodies in Metropolitan Regions to ensure sustainable development. In addition, a dialogue between Metropolitan Regions and the national and European levels is required.
To succeed in sustainably developing competitive Metropolitan Regions, it is important to establish cooperation that invites all different institutions and stakeholders to join the planning process from the areas and sectors of Metropolis and region, land use and transport, politicians and administration and citizens. The “AND” is the key. Cooperation is the engine of the “AND”. Therefore one needs to adopt a broad approach. It is only by adding different perspectives that sustainability can be built; interrelations and dependencies are strong. That is why even more links must be established.

The general discussion about governance has to find its way into the Metropolitan Regions, where everyone has their own situations based on certain circumstances. The partners in Catch-MR have discussed governance in theory and with reference to a range of practical experiences and achievements, providing a good basis for others to follow. Simply transferring a model of cooperation from one region to another, without any adaptations, will most likely fail. Decision-makers in Metropolitan Regions and experts in planning can learn from the different concepts presented in this chapter. Insights regarding the strengths and weaknesses of different approaches in traffic and in land-use planning in the short and in the long term were presented. The conditions under which the challenges were successfully addressed and mastered must be understood. Therefore the description of the situation of urban sprawl in the participating Metropolitan Regions must also be taken into account. Finally, regional identity and regional consensus require a sense of common understanding: successful solutions will be found if stakeholders are motivated and when there is time for discussion and exchange.

Better coordination of the development of land-use patterns, integrated with the development of transport infrastructures and services, will not reduce traffic and create sustainable land use immediately. Built structures and the organisation of public space and private properties may be constants through decades if not centuries. This is one good reason why development should be based on a common vision and a good plan. Even if effects cannot be expected right away, if Metropolitan Regions are to increase sustainability based on development patterns, the time to act jointly is now.
3 ENCOURAGING MORE USE OF PUBLIC TRANSPORT

3.1 Making Metropolitan Regions more competitive and avoiding queues

Mobility is vital for businesses and for a high quality of life, within the toleration limits of the environment. Comfortable and reliable public transport services should therefore be provided.

In the past 50 years, mobility has been increased in Metropolitan Regions especially by building more roads for cars, which have given individuals better access and freedom to choose when and where to travel. Cars have become more attractive than public transport in most suburbs and neighbouring towns. In cities and their surroundings however, the sum of individuals’ freedom to travel has led to queues and chaos, especially during peak hours. Today, there are too many cars in the streets of cities that were not built for such a high demand for transport.

Cities’ inhabitants increasingly demand transport services that run frequently and without delays. This chapter deals with four main strategies which have been identified by the partners to increase mobility through the use of public transport:

- coordinating the financing of public transport in the Metropolitan Regions;
- enhancing intermodality;
- building and operating park & ride;
- introducing road user charging.

3.2 Results from the Inventory

The status and key experiences from the Metropolitan Regions are summarised here, as they were highlighted in inventory responses from the partners. The inventory results are presented for each of the four main themes as listed above.

3.2.1 Coordinated financing of public transport

Financing public transport is the most crucial factor for succeeding in increasing its attractiveness and use

The situations in the partner Metropolitan Regions appeared to vary substantially, both in the material presented and the way in which it was organised. The question of financing public transport is therefore reviewed in greater detail here than the other themes. Using statistics from EUROSTAT (2010), the following picture gives some information about the variation in costs and incomes among the Catch-MR countries and cities.

The figure 3.1 clearly shows the large differences in both costs and abilities for passengers to pay for transport. The costs and income levels in Berlin, Vienna, Rome and Gothenburg are broadly similar in scale, whereas Budapest and Ljubljana have about half the level of costs and Oslo has about 30% higher costs than Berlin. Importantly, the least variation is seen in the costs of civil engineering among the partner countries, suggesting that they are dependent on many of the same international contractors for developing their transport infrastructure.

Financing public transport is probably the most crucial factor for succeeding in increasing its attractiveness and use. There is broad agreement that Metropolitan Regions require stable and long-term financing of public transport. Stable and long-term financing gives certainty for investment programmes and for meeting operating costs, while at the same time enabling strategic decisions to be made and followed up, for example as related to improving quality or cost-effectiveness. Short-term uncertainty makes...
planning for such large and complex systems as public transport in Metropolitan Regions very difficult and essentially ineffective. Public transport requires large costs and revenues, and there is considerable variation in how the regions solve the financial tasks. Cities with lower incomes and general levels of production are likely to face bigger challenges in raising funds for key transport facilities without receiving additional, external support. This shows how important external financial support is for economically weaker regions, and the EU has given financial support for investments in many such areas.

In most regions, national authorities are responsible for trains, both for the building and running of the infrastructure and for running the train services. The formal and fiscal responsibility for the rest of the public transport is normally delegated to the regional level (Länder, regions, county councils), but in some regions the municipalities and districts have ownership and responsibilities. A brief overview is given of the main sources of revenue for public transport in the Metropolitan Regions, as well as some more general remarks.

- **All participating Metropolitan Regions are looking for ways of increasing revenues and reducing costs**

Looking briefly at the construction costs for housing, non-residential buildings and infrastructure, the variation between countries is the least for civil engineering construction, which includes transport infrastructure (see figure 3.1). This is probably because infrastructure projects are often large-scale and attract international firms, which have similar costs and standards between countries. By comparison, house builders are mostly regionally or nationally based and are adapted to the local and regional standards and costs – and households’ purchasing power. As an example of this, the Metro 4 construction in Budapest was carried out by several international consortia composed of French, German, Austrian, Japanese and Hungarian companies, which probably incurred costs for the local authorities in Budapest that were up to three times more expensive, relative to the local purchasing power, than it would have been in Berlin.

Looking at the Metropolitan Regions as a whole, 40–70% of the revenue for operating costs comes from ticket sales. Public funding represents 30–50%, and there are other sources like social state funding (Berlin-Brandenburg) and toll ring revenues (Oslo). City transport represents 50–75% of allocations to transport funds, while regional/suburban transport represents 15–35%.

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**Mayor István Tarlós**
Municipality of the City of Budapest, Hungary

“We have several goals for developing the public transport in Budapest and in its agglomeration, the most important of which is to undertake effective measures to increase the competitiveness of public transport. We are looking forward to implementing the achievements and best practices learned through CATCH-MR as much as possible.”

Photo: Mihály Majtényi

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Figure 3.1 Indexed transport-related costs and household incomes in the partner countries and cities; Berlin = 100 (Diaz Muriel 2008, Price … 2012).
Based on information provided by the project partners, the total annual costs of operating public transport services in the Metropolitan Regions have been estimated. Since the regions vary in size, the total costs are then divided by the population to give an approximate average cost. This is shown in Table 3.1, estimated as costs for public transport per 1,000 inhabitants in the Metropolitan Region (2009):

<table>
<thead>
<tr>
<th>Metropolitan Region</th>
<th>Costs per 1,000 inhabitants in Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ljubljana, Budapest and Vienna</td>
<td>150,000 – 300,000</td>
</tr>
<tr>
<td>Berlin-Brandenburg</td>
<td>400,000</td>
</tr>
<tr>
<td>Oslo and Gothenburg</td>
<td>600,000</td>
</tr>
</tbody>
</table>

*There was not sufficient data to include the Province of Rome.

Table 3.1: Costs for public transport per 1,000 inhabitants in the Metropolitan Regions in 2009 (Inventory … 2011).

The average costs are of course related to levels of income. Operating costs depend on local wage levels. Tickets are cheapest in Metropolitan Regions with low personal incomes and most expensive in regions with high personal incomes. Costs are increasing in all the Metropolitan Regions. The project partners have pointed out a wide range of strategies to both reduce costs and increase incomes. Not all of these strategies are sustainable in the long term:

**Cost reductions:**
- reduced labour costs (Berlin, Vienna, Budapest);
- reduced investments – short term (Budapest);
- improved coordination (Rome, Oslo);
- electronic ticketing (Ljubljana, Oslo);
- separation of capital management and operation (Rome).

**Income increases:**
- increased fares (all Metropolitan Regions);
- more passengers (Berlin, Rome-Lazio);
- marketing and attitudes (Rome-Lazio);
- simplified fare scheme (Ljubljana, Oslo-Akershus);
- increased control (Budapest).

Challenges in Metropolitan Regions are complex. The overall picture suggests that there is chronically insufficient funding for public transport in all the Metropolitan Regions, which in some cases is made worse by low levels of revenue. At the same time, investment costs are high and the operating costs are increasing.

An additional finding is that each Metropolitan Region quite clearly has its own experiences, discussions and history in public transport development, making the picture and understanding of the challenges and opportunities unique in each case. This can be called “path dependency”, referring to the fact that decisions taken in previous periods – sometimes many decades ago – may still have a strong influence on the current solutions for financing public transport, and on the possibilities to improve the financial situation in the years ahead.
The Metropolitan Regions require stable and long-term financing of public transport. Stable and long-term financing gives certainty for investment programmes and for meeting operating costs, while at the same time enabling strategic decisions to be made and followed up, for example as related to improving quality or cost-effectiveness. Public transport requires large costs and revenues, and there is considerable variation in how the regions solve the financial tasks. Cities with lower incomes and general levels of production are likely to face bigger challenges in raising funds for key transport facilities without external support. Looking at the Metropolitan Regions as a whole, 40–70% of the revenue for operating costs comes from ticket sales. Public funding represents 30–50% and other sources represent the rest.

3.2.2 Successful intermodality requires frequent transport services

Public transport is not able to offer direct connections for every journey. However, using public transport should become more attractive. This can be achieved especially in Metropolitan Regions by developing and strengthening interchange nodes. Quick, comfortable and safe interchange between routes and/or transport modes can make public transport systems more competitive compared to private modes, especially private cars.

Intermodal passenger transport involves more than one mode of transport. A trip can be served by public transport modes in combinations such as bus and train, or bus and ferry. Combining private and public modes, such as bicycle and train or car and metro, is another option. In order to achieve the benefits of combining transport modes, coordinated timetables and short and easy connections are of great importance. Intermodal nodes can also be much more than changing points. A range of other services like shopping and food service can be connected to the transport functions, enhancing the level of service. The range of available non-mobility functions will often increase with traffic levels and the numbers of potential customers at the specific nodes.

Public transport is, in its simplest form, efficient in serving a concentrated demand for transporting many people between a few points. However, personal trips are diverse, with different origins and destinations. While personal transport modes make door-to-door trips possible for each individual, it is impossible to meet the same journey demands by

Figure 3.3 Systematic illustration showing the need for intermodality for journeys that are not served by a single service-line (Documentation ... 2010, 10).
direct public transport for everyone. There will usually be a need to change between modes of transport in a large number of the trips. This is why convenient changing is a key competitiveness factor for public transport in relation to cars in a city region.

The findings show the most important factors for a good intermodal node. Both mobility and non-mobility functions for a good intermodal node were referred to by most partners:

- Important elements of the public transport services themselves were mentioned, such as high frequencies, direct connections and coordinated timetables.
- Good connections between modes and passenger information, ticket machines or counters, and short and comfortable walking connections are preferred.
- Shopping and public/private services were the most important features according to most partners.
- The general conditions of the node with reference to safety/security, maintenance and cleanliness were also important.

Congestion on the roads was also given as an important factor that can increase the relative attractiveness of using public transport at intermodal nodes, although this cannot be seen as a strategy!

According to the Catch-MR partners, the most important factors for a good intermodal node are good public transport services (high frequencies, coordinated timetables), good connections between modes (short and comfortable walking connections, passenger information), shopping and services, as well as the general conditions of the node (safety, security, maintenance, cleanliness).

### 3.2.3 Park & ride sites in the cities, many in the regions

There are different approaches to how and where park & ride facilities should be implemented, depending on whether the locations are in the city or its hinterland. The feedback from the project partners shows that most of the core cities have relatively few park & ride sites with high average capacities, while in the regions there are many sites but with a lower average capacity. These results are logical considering that the Metropolises have a smaller territory, higher land values and higher traffic density than their respective regions.

Regarding the total capacity for park & ride, Vienna-Lower Austria stands out with more than 40,000 spaces, followed by Rome-Province of Rome (about 20,000) and Berlin-Brandenburg (about 15,000). In Lower Austria, 4% of the total population can find a park & ride place daily.

![Figure 3.4: Ruter’s vision of a future intermodal node in Skøyen, Oslo (Ruter AS 2012).](image-url)
In most of the partners’ regions, bicycle racks are usually an integral part of the park & ride sites.

The ownership of park & ride sites is quite similar in almost all the partner Metropolitan Regions: the municipalities and in some cases the railway companies/authorities own the sites. In Vienna-Lower Austria there are also some privately owned sites, some of which were built under a public-private partnership. Park & ride sites are managed either directly by the owners, their public companies or occasionally by private contractors.

There are different models for the pricing of park & ride services: in some Metropolitan Regions most sites are free of charge, while in others (Ljubljana, Vienna-Lower Austria) the park & ride sites in the Metropolis have parking fees. This might be due to the fact that these two Metropolises feature by far the biggest park & ride facilities on average, which need more investment and have higher maintenance costs, and probably the market demand is also higher.

The fees charged for park & ride are usually linked to the public transport ticketing, where discounts are offered to users of both the parking and the public transport to encourage more use.

The data from the project partners shows that most of the core cities have relatively few park & ride sites with high average capacities, while in the regions there are many sites but with a lower average capacity. Regarding the total park & ride capacity, Vienna-Lower Austria stands out with more than 40,000 spaces. In most regions bicycle racks are usually an integral part of the park & ride sites. The ownership of park & ride sites is quite similar (municipalities, railway companies/authorities). There are different models for the pricing of park & ride services: in some Metropolitan Regions most sites are free of charge, while in others those in the Metropolis have parking fees. Fees are usually linked to the public transport ticketing.

3.2.4 Road user charging

All of the seven Metropolitan Regions had some kind of charging. These cases illustrate the variety of starting points that city-regions may have for discussing road user charging options for the future. The feedback shows the following approaches:

Charging for certain types of vehicle:
- Berlin-Brandenburg has a national charging system for trucks using motorways.

Charging for a major infrastructure system:
- Ljubljana/Slovenia has a toll for using the highways;
- Rome/Italy has a similar toll on motorways;
- Vienna/Austria has a national toll on freeways and urban freeways.

Charging for transport in the Metropolitan Region:
- Budapest has a motorway toll and is preparing for a congestion charge as an obligation through a contract with the EU on co-financing the Metro 4 project;
- Gothenburg is planning to introduce congestion charging by the end of 2012;
Oslo has had a toll ring on all access roads into the city for 20 years to fund major investment costs.

Oslo has road user charging and both Gothenburg and Budapest are planning to introduce road user charging. Gothenburg has decided to introduce a congestion charging from 2013. Ljubljana and Rome are discussing road user charging, and Berlin-Brandenburg and Vienna seem to be very unlikely to introduce or discuss road user charging.

All of the seven Metropolitan Regions had some kind of road user-charging, although the models are different: charging for certain types of vehicle (e.g. trucks), for a major infrastructure system (e.g. motorways), or for transport in the Metropolitan Region (toll ring, congestion charge). Some Metropolitan Regions have already introduced road user charging, and some others are planning to do so, while others are not considering it.

3.3 Review of practices: How are the challenges tackled in our regions?

Selected examples from the partners are summarised here to show how key challenges can be resolved and as a basis for the transfer of ideas and innovation.

3.3.1 Financing

A key factor for financing is how the public transport service is organized. Public transport services have evolved in each region according to local, historical and cultural factors. The comparison of partners’ experience suggests clearly that a form of joint organisation of public transport services across the whole Metropolitan Region can have big advantages from the point of view of financing.

SIMPLIFYING TARIFF-ZONES IN OSLO-AKERSHUS

As well as enabling efficient service provision, the recent simplification of the structure of zones and fares in Oslo and Akershus is an example of how a unified organisation can pave the way for substantial improvements. The introduction of simplified tariff-zones in 2010 has made the transport system easier to understand and reduced the numbers of people who are affected by living or working near tariff-boundaries. It will also make it easier to integrate different transport services in the years ahead (Nordstrøm 2012, Samstad 2012).
Encouraging more use of public transport

REORGANISATION AND SIMPLIFICATION OF FUNDING IN BRANDENBURG, 2005

In 2005 Berlin-Brandenburg decided as the first Land (state) in Germany to rearrange public transport funding at a district level. The objective was to combine the earlier transfer of tasks (providing bus- and tram-based public transport services) with full financial responsibility. From 2005 onwards funding sources were combined and no longer awarded to operators but exclusively to transport authorities (districts and district-free municipalities). This required disentangling the jungle of public funding sources and concentrating funding. Additionally, a more efficient use of public funding was achieved by the introduction of a dynamic distribution key. The yearly payments to the 18 transport authorities are now based on the area concerned (30%), the passenger-km (20%), the passenger numbers (20%) and the amount of co-funding of the respective transport authority (20%). Thus the distribution key also guarantees a client-centred approach of the transport authorities.

According to the principle of subsidiarity the responsibility for the task and the financial resources are now combined at the level which can best provide the required services. Additionally the transfer of financial resources has increased the possibilities of local authorities to act, since funds are at least partly at free disposal. Furthermore, the transport authorities were enabled to act in accordance with EU regulation 1370/2007. Now public service contracts are regularly closed after a competitive tendering procedure.

BERLIN-BRANDENBURG: INTEGRATION OF RAIL SERVICES INTO THE METROPOLITAN REGIONAL TRANSPORT SERVICES

A closer integration of the S-Bahn and regional rail services was reached by establishing clear leading roles for public transport co-ordination procedures between Berlin and Brandenburg. Both states agreed that Berlin has the leading role for co-ordinating the S-Bahn network and Brandenburg for regional railways, without either state giving up their legal/formal responsibilities. Based on their Public Transport Plans both federal states co-ordinate their regional rail transport using the joint organisation of Verkehrsverbund Berlin-Brandenburg (VBB). In the case of discrepancies, under this agreement both federal states have to find a bilateral solution between the respective public transport authorities, i.e. the Ministry for Infrastructure and Agriculture in Brandenburg and the Senate Department of Urban Development and the Environment in Berlin.

Figure 3.7 VBB - structure.

Verkehrsverbund Berlin-Brandenburg (VBB) as public transport association

- coordination
- planning
- tendering

41 public transport operators

State Secretary
Rainer Bretschneider
Ministry for Infrastructure and Agriculture, Brandenburg, Germany

“A well-functioning public passenger transport system like our VBB is the glue that binds the Metropolis and the surrounding region together. We are making an effort to increase the share of renewable energy in public transport through innovative, regional solutions.”

Photo: A. Obst, M. Schmieding
3 Encouraging more use of public transport

strategic framework, for channelling funds for key investments and improvements. To carry this further, the Province of Rome has additionally proposed to establish a Single Mobility Agency at the metropolitan level, to plan and coordinate interventions and services across the whole area.

- Joint organisation enables strategic decisions and economies of scale

Experience from Berlin-Brandenburg and Oslo-Akershus suggests that by simplifying their funding and management structure, the owners of public transport are more able to see opportunities and make strategic decisions, as well as attain efficiency measures through economies of scale.

At the same time, transport authorities should be aware of the potential risks posed by public transport being run as a monopoly, where a culture of uncritically meeting all costs can lead in the worst instance to chronic inefficiency.

3.3.2 Intermodal transport

Mobility with public transport is easy for routes that are well served by a single line from start to destination. Most city centres have radial routes that enable people to get there from surrounding suburbs. However, journeys across the city or Metropolitan Region may often require more than one service. Good connections, with information and service provision, are key factors. The main examples from the partners are given below, from Gothenburg, Vienna, Rome, and Potsdam, and are focused on developing and organising intermodal nodes. In addition, the importance of information and communication technologies (ICT) has emerged during the Catch-MR project, as a new and exciting way to encourage intermodal travel – a kind of virtual intermodal node. The example given here is also from Vienna.

- From strategy to guidelines: The Gothenburg case

In the Gothenburg Region there is a new attitude towards changing from the current society of cars to a society of sustainable transport. The strategic basis of this is the structural illustration of the Gothenburg Region. A substantial shift to public transport is necessary. The main aim of the K2020 strategy is to double the present public transport usage by 2025. The development of interchange nodes is an important part of the strategy, as the direct links to the city centre have reached their maximum capacity. Changes are therefore necessary.

The ideal intermodal node should achieve as many of these points as possible. This requires good cooperation between all parties involved in planning.

GUIDELINES FOR AN IDEAL INTERCHANGE

The Gothenburg Region commissioned Gehl Architects to produce guidelines for “The ideal changing point” from the passengers’ perspectives. These guidelines summarise the characteristics of a good intermodal node in the following 9 points:

- 1. Safe and secure intermodal nodes. A busy and lively area is good for security, while technical solutions should be designed to be safe for the users.
- 2. Modern and vivid intermodal nodes. Mixed functions, including the possibilities of activity and rest, with opportunities for many activities.
- 3. Concentrated intermodal nodes. Location at the hub of a well-functioning network; also a crossing point, with high-density population and mixed land use.
- 4. Accessible intermodal nodes. Convenient connections that are accessible for everyone, with clear passenger information.
- 5. Meeting points. Meeting points at central and visible places should be provided for different levels of contact, and possibly longer stays.
- 6. Pleasing atmosphere. Intermodal nodes should have a good microclimate, be of human scale and offer a pleasant atmosphere.
- 7. The intelligent intermodal node. Clear and visible passenger information, supplemented by individually accessible information through new technology.
- 9. Charismatic intermodal nodes. Designed for all passenger groups, with strong identity.

Deputy Mayor
Johan Nyhus
Municipality of Gothenburg, Sweden, Department of City Planning and Chairman of the Steering Committee of Regional Planning at the Göteborg Region Association of Local Authorities (GR)

“The Gothenburg region is committed to obtain regional growth through continually support an efficient and an attractive public transport system. This will contribute to a regional sustainable development.”

Photo: Archive of the Municipality of Gothenburg
and management, as well as coordination between urban planning and transportation. Selected good practices from the partner Metropolitan Regions are given below.

- **Berlin-Brandenburg:**
  **The Potsdam main station example**

  Potsdam main station in Berlin-Brandenburg involves a range of different modes: regional trains, S-Bahn, regional and local buses, tram, bicycles (bike & ride and bike rental), private cars (park & ride) and taxi. The walking distances between the modes are short, barrier free and mostly covered; the timetables are coordinated. The train station is integrated with a shopping centre and it is very lively all day long, which also contributes to security.

- **Vienna-Lower Austria:**
  **The Praterstern example**

  Praterstern in Vienna is a junction of two subway lines and several regional rapid rail lines (S-Bahn) as well as a group of tram and bus lines. The attractive, glass-covered structure includes sheltered bike places and so-called kiss & ride places for cars. However there is no room for park & ride. It is also integrated with a small shopping centre.

- **Rome – Tiburtina transport terminal**

  The new transport terminal at Tiburtina in Rome represents a major regional development. It combines several heavy rail services (national, regional and international fast), including high-speed, various regional and provincial commuter lines connecting to the airport, two subway lines and the largest interchange road of the Province of Rome (city buses, provincial, regional, national and international). About 20,000 m² of modern office space is provided in a major new centre above the transit area, and the development may in the future be linked to modernisation and relocation of public sector offices.

  The investment project is jointly funded and managed by the transport bodies (Rete Ferroviaria Italiana and Trenitalia), the City of Rome, the Province of Rome and the regional authorities.
■ A to B – ICT solution in Vienna

ITS Vienna Region provides accessible virtual intermodal nodes for personal computer and mobile phone users. This digital, multimodal transport planner and real-time travel information is available under the brand “anachb.at” (Engl.: A to B.at)

![Figure 3.8](Image)

Figure 3.8  The “anachb.at” multimodal transport planner (Internet 2).

■ Travellers get recommendations for real-time, multimodal journeys across the region

Citizens are presented with travel options, including all modes of transport and even modal changes. Real-time information allows the choice of the optimal mode for the trip. The service includes the whole Metropolitan Region and even extends beyond it, crossing many administrative borders. It also offers an image of the traffic situation that gives the traveller an instant and up-to-date overview.

■ Broad cooperation has enabled databases to be linked up

ITS Vienna Region was initiated jointly by the transport authorities of three Austrian federal states: Vienna, Lower Austria and Burgenland. The service is based on a detailed graph of the transport network and a traffic model. Cooperation with a wide range of partners (e.g. national railway, national highway administration, urban public transport operators, taxi companies, bike and car sharing companies, partners from research and business, police, media) keeps the information up to date. It is then available to the public via the internet and mobile applications.

■ Future expansion is possible

In the future the service might be extended to the CENTROPE area, crossing national borders and available in various languages.

3.3.3 Park & ride

■ Park & ride developments in Oslo-Akershus

After 20 years of development there are 6,000 park & ride spaces, mostly in small sites in Akershus connected to railway stations. Most of them are free or almost free to use. The sites built before 2005 had quite low investment costs, around 2,500 Euro per parking space, as it was possible to use existing open land which had little alternative use. The costs for later park & ride sites are higher, at around 6,000 Euro per parking space, and in urban areas this may increase to 25,000–40,000 Euro. Trains normally stop in towns, which makes land and construction of parking even more expensive.

There is no general policy on what to do once all park & ride spaces are full. It is getting very expensive to increase capacity, as the areas have become more attractive for development since being first established. Picking cheaper locations and introducing feeder buses to the train stations is too time-consuming to be a real alternative. Generally as a first step a fee is introduced for people without a seasonal ticket. At a few sites a general system of payment has been introduced for all users, a solution that works and gives enough capacity.

In Sonsveien (60 km from Oslo) there is a dedicated park & ride railway stop, which is close to a highway but far from settlements. A park & ride site with 145 lots and a feeder bus service accounts for 2/3 of the traffic that uses the station. It is however questionable whether only 500 passengers per direction a day justifies an extra railway stop, also considering that the feeder bus could also simply extend its route to the next city centre. An extra stop has an investment cost amounting to 10 million Euro.

![Destination board (Oslo). Photo: Hiromoto (flickr)](Image)
PARK & RIDE SITES IN BUDAPEST

The former Budapest Transport Association (BKSZ) and Parking Ltd took a leading role in organising consortia and preparing project packages. Developments were concentrated on the most used railway lines of the Metropolitan Region, where demand is high due to the suburbanisation of the last decades and the train service is of relatively good quality. In the first round 13 railway stations were selected in the central agglomeration and 6 in the outer districts of Budapest, where railways offer a quick connection to the centre of the city over long travel distances. The completed park & ride sites provide spaces for 1,404 cars and 650 bicycles. 3 of the sites are also integrated with bus stops, and the Budapest Transport Company (BKV) introduced a new feeder bus service to one of these railway stations, harmonised to the train timetables. All sites are supervised by security cameras and free to use.

The second round of the EU financing also contributed to a number of park & ride sites, all of them in the central agglomeration. Experiences from the first round were shared with the new partners, and in two cases the sites built in the first round were expanded. Some municipalities also realised successful projects on their own or with local partnerships.

Another example is Strømmen, where 350 park & ride places are located very close to the railway station with a service of every 30 minutes. However it is also used by workers at the nearby shopping centre, who can park here for free. There are plans for residential developments in the immediate neighbourhood, which raises the question of whether it is good to have big park & ride areas in the middle of towns. Increasing land value in the long term might lead to the end of park & ride in such areas.

- EU co-financed park & ride developments in Central Hungary

The lack of sufficient park & ride capacity has for a long time been seen as a problem in the transport system of Budapest. In the last couple of years the EU co-financed Central Hungary Operational Programme has provided funding to take a step forward. 19 sites were developed with a capacity for 1,404 cars and 650 bicycles, some of which have since been expanded. Some new locations have also followed.
3.3.4 Road user charging

Road user charging can be an important new tool

Many cities have considered road user charging, but few have implemented it. This can be organised in different ways, with a variety of cost-structures, technologies and managerial models. The success of the Oslo system is discussed in some depth, as are the possibilities and limitations for road user charging in the other partner Metropolitan Regions.

Road user charging in the Oslo Package is a funding scheme, whereas in Gothenburg the congestion charging is also intended to reduce queues and emissions. Metropolitan Regions have often experienced that national authorities do not grant enough money to develop the transport structure as necessary for the growth and development of the city-region. This was the situation in both Oslo and Akershus and in Gothenburg prior to introducing road user charging. In both Gothenburg and Oslo, the political parties discussed the likelihood of getting more national financing for transport over many years. When the majority of local/regional politicians finally recognised that the chances of increased national funding for their transport were extremely limited, they joined forces and supported the proposal of a road charging scheme.

Unlike funding for a single structure such as a bridge or a tunnel, or for a closed infrastructure system such as a motorway network, urban transport needs are more complex and require a more comprehensive

THE OSLO PACKAGE HAS ENABLED MAJOR TRANSPORT IMPROVEMENTS AND REDUCED QUEUES

After years of discussion, the Oslo Package 1 was opened in 1990, primarily for road building. The Oslo Package 2 was planned to accelerate the development of public transport infrastructure. Oslo-Akershus is now facing new challenges. The population is expected to increase by more than 30% over the next 20 years, and there will be a large growth in both jobs and traffic. The local politicians’ proposal for a third Oslo Package was approved by the Norwegian Parliament.

Oslo and Akershus have implemented a fully automated electronic cordon over the period of 20 years. There is no time differentiation of toll charges through the day and no periodic subscriptions are available, so that each passing is charged. Each car driver now pays 3 Euro to pass, including on public holidays. Vehicles passing the toll ring are charged when driving into the city, and have a free return. Each year, about ¼ billion Euro are raised from the toll ring. Supplemented by negotiation with national funding, this forms the basis for both transport investments and for operating public transport, in addition to ordinary transport budgets.

A rolling list of projects is proposed and reviewed annually through local political negotiations and a final decision in parliament, the Oslo City Council and the County Council in Akershus.

The original booths and paying barriers in Oslo have been replaced by simple gantry-points with electronic cameras. In Oslo-Akershus there are some additional charging points to the west of the city, because these roads are granted more money than the rest of the road network.

The objective of the Oslo Package is to:

- improve mobility for passengers and commercial traffic;
- reduce congestion during rush hours through providing more capacity and transport alternatives;
- facilitate more trips by public transport, bicycling and walking;
- reduce noise and air pollution and greenhouse gas emissions;
- reduce the number of fatalities and serious injuries by traffic;
- ensure access for all groups of transport users;
- improve the environmental qualities of the city/suburbs.
financing system. Improved transport in a Metropolitan Region usually requires improvements in links and structures across the region. Some strategic transport links may also benefit the region as a whole — including residents and businesses which do not often use the links directly — such as a central tunnel, major terminal or a metro link. In such cases, a more universal charging scheme is legitimate as an alternative to many smaller tolls or other funding schemes linked to individual projects.

Road user charging in Oslo-Akershus provides more capacity and transport alternatives

Almost half of the 8.5 billion Euro in the current phase of the Oslo Package (2008–2027) will be used for public transport investments, including upgrading and new projects. A local proposal to use toll revenues to supplement the operating costs of public transport was also approved for the new package. At least 25% of the toll revenues will be used to buy public transport services.

The relationship between toll-charging and the use of public transport has been studied using data from Oslo-Akershus. Car traffic has been reduced marginally by recent increases in the toll charge, though it is not clear whether these people opt for public transport (Nordstrøm 2012, Samstad 2012). The biggest difference made is in the overall transfer of funding from car users to improvements in public transport, which have definitely resulted in more passengers (see figure 3.9).

Gothenburg is introducing congestion charging in 2013

In Gothenburg the authorities have chosen to invest the funds from congestion charging in infrastructure for roads and public transport, but they will not be giving any financial support to running public transport. In Gothenburg the price will vary from a free passage during the night (18.30–06.00), to 1 Euro at midday and up to 2.30 Euro during the morning and afternoon rush. The fee will be paid on workdays except Saturdays. The fee is not paid during July.

Open and legitimate management is a key to success

It is important that financing from road user charging is organised with full transparency. Public authorities and the general public must be confident that the revenues are invested in, or used to support, transport in the region. There must be no shadow of a doubt that revenues are used for transport purposes alone.

The City of Oslo and Akershus County Council established a joint holding company, Fjellinjen AS, to manage the technical and financial aspects of its road user charging scheme. The main objective of the company is to maximise net revenues from the toll ring, keeping operational costs to a minimum. The City of Oslo owns 60% and Akershus County Council 40% of the company. This means that, as a rule of thumb, about 60% of the revenues go to fund projects in Oslo and the rest to Akershus. The Norwegian government contributed 50% of the total investment programme in the first years of the toll-ring scheme, but the national contribution has been significantly reduced since 1990. Nonetheless, through open and transparent management, the political responsibility for priorities is clear and strengthens the democratic position of the programme.
Road user charging is an important additional source of income in Oslo-Akershus, with wider economic benefits. Most of the money is used for implementing a rolling, strategic transport investment program, as well as topping up the public transport subsidy for operating costs in Akershus County.

Economists would argue that this is a way of integrating the external costs of car use, as well as leading to economic benefits from improved traffic. However, at the end of the day, the Catch-MR partners view road user charging primarily as an additional source of revenue.

Oslo-Akershus introduced the toll ring in 1990 to raise funds for the Oslo Package, financing road developments. Later with the packages 2 and 3, the use of revenues was shifted towards the development and later also the operation of public transport. Gothenburg also aimed to influence traffic patterns, and will vary the price according to the time of day. Both schemes are based on strong political agreements.

3.4 Lessons learned: What did we learn from the exchange of experiences?

3.4.1 On financing public transport

- **General recommendations:**
  Joint financing and management enables a more sustainable transport system

The wide variety of experiences among the partners gives the following general lessons:

- **Simplify the management and financing structure**

The owners of public transport can simplify their management and financing structure. This will enable them to see opportunities and make strategic decisions, as well as attain efficiency measures through economies of scale. Enabling efficient service provision through simplifying the structure of zones and fares can pave the way for substantial improvements.

- **Optimise the resources**

Care should be taken to avoid the risk of developing a culture of uncritically meeting all costs, which can lead to chronic inefficiency. A clear separation between transport authority and operator is advisable, and must be followed by an open tendering process, decisions and signing of contracts. A sharp eye for cost awareness, in order to be more cost-effective and to look for cost-saving solutions at all levels, is therefore highly recommended.

- **Coordination between different administrative levels is crucial**

  Transport initiatives from local areas/municipalities are helpful and contribute legitimacy in relation to their specific transport challenges and solutions. This might give room for more flexibility in spending, both for operating costs and investment measures. Coordination of local area/municipal public transport plans, where they exist, with the national or regional plans, is very important. Each country has organised its system of government and tiers of local government differently, from Germany with four levels to Slovenia with only two levels. But coordination is vital! Public authorities must try to agree and commit themselves to implementing the same operating interface (software) and tariff systems. This should enable a more adaptable and cost-efficient service, while at the same time maintaining a high level of reliability.

  Ticket services station Oslo.
  Photo: Gunnar Bothner-By
Long-term funding stability is essential for a well-functioning public transport system. Simplifying the funding and management structure – e.g. separating transport authority and operator(s), simplifying the fare structure – makes the system more efficient, and also helps the owners to make strategic decisions.

- Focus on the strategic level is important for improvements at the Metropolitan Region level

Policy for financing public transport in Metropolitan Regions has to be developed in a long-term, strategic way. It is important to develop long-term, realistic goals that are not strongly influenced by day to day issues. Subsidiarity is important, as is finding the best regional level for decisions and administrative work relating to financing for public transport.

- Increased economic efficiency is an overriding goal

Improved financing for public transport can be broadly understood in the context of revenues/incomes and expenditures/costs. The financial situation for public transport can be improved through improved efficiency, so that either the same service can be provided for less money, or better services can be provided for the same costs. This is a serious challenge, since expenditures to improve services will not necessarily lead to corresponding increases in revenue, at least in the short term.

For example, increased frequency or more comfort in buses or trams can double the operating costs but not immediately result in more tickets being sold, as the majority of passengers may already use season tickets and have stable travel habits. In the long-term, however, improved services can increase the attractiveness of public transport so that revenues should also increase.

- Investment programmes should be developed and financed at the strategic Metropolitan Region level

In Metropolitan Regions which are experiencing the negative effects of economic recession, additional funding for strategic transport investments can boost the local economy, both in the short term through large-scale construction projects and in the longer term through creating a more attractive and accessible environment for businesses. There is a danger of overlooking the risks of repeating previous examples of poorly planned investment during times of more abundant funding. Investments should be planned over the long term, maximising the chance of substantial increases in ticket revenues. At the same time, efforts should always be made to increase the sale of tickets to obtain more funding early on in an investment programme. Lastly, public-private partnerships should be explored as a mechanism for enhancing flexibility in the investment process through long-term financial support and risk sharing.

Procurement of services is an important function for controlling costs and stimulating quality.
Competition between service providers can be encouraged to stimulate both cost-effectiveness and improved quality of transport services. Competitive tendering for bus services has shown positive results in many regions, but competition for the tracked services, particularly trains, can be developed further. Once the principle of tendering for services has become established, incentives and agreements can be introduced, including payments relating to service quality, passenger volumes and other policy objectives.

#### 3.4.3 Park & ride

Park & ride is one option for intermodal transport, and has been widely applied at the Metropolitan Regional level where it appears to be most appropriate. Regional strategies should be developed for park & ride that take locations and costs into account.

- Park & ride in central locations has a high cost and should only be considered for a small percentage of travellers. Parking fees should be applied for parking at central locations, possibly with price reductions for users of public transport.
- Park & ride locations outside the city centre are usually cheaper than in central areas, due to lower real estate prices. Their location, capacity and price level should be however chosen carefully, not to make them too attractive compared to feeder buses to local train stations. In non-central locations, parking fees may also be applied to reflect the cost of developing and managing the sites. Sites for park & ride in non-central locations should be viewed in the long-term for potential redevelopment as the demand for building land near stations increases.
- Bike & ride bicycle racks should be integrated in the park & ride system, especially in more central areas, as they are much more sustainable, while consuming less space and having considerably lower investment costs.

Generally, park & ride should be competing with car use alone and not with public transport. An overall strategy should be based on providing good public transport plus some additional car flexibility, rather than a good car system with some additional public transport. Even extensive provision of park & ride sites can only accommodate a small percentage of travellers, and may therefore be an inefficient use of resources. The other option is to build small, decentralised park & ride sites for a large number of public transport stops in the region, making local and flexible use possible.
Costs may be lower, as the land they occupy is cheaper. A more efficient approach than parking at railways or metro stations could then be to provide more frequent and better bus services with limited parking capacities at key bus stops.

Park & ride may often be a first step to attracting people to use public transport in low-density areas. However, a park & ride system that is too attractive may encourage car use, and even maintain urban sprawl. People should be encouraged to change their whole mobility chain, and only use their cars for special needs. In expanding regions the increasing land values could lead to more intensive land use and thus to a better public transport system and finally to less need for park & ride.

The success factors of specific park & ride sites include good road access, free places, security and cleanliness, direct public transport connections, and the availability of services. Necessary passenger information includes timetables, free capacity, and indication of the next park & ride. The park & ride sites should also share a common appearance.

If park & ride is too cheap, people also use it when they do not need it; if it is too expensive, people may drive into the city. Pricing should be managed in an integrated and systematic way when setting public transport ticket prices, park & ride and inner-city parking fees, and potential road user charges. Park & ride use should be considerably cheaper than driving into the city, but more expensive than using public transport for the whole journey (in areas where sufficient public transport options are available).

Using park & ride should be an alternative to using a car for the whole journey, and not an alternative to public transport use. This should be reflected in the choice of locations, capacities and price structure. Cost-efficiency should always be kept in mind when deciding about park & ride developments. Bike & ride systems should be given priority, as they are not affected by these constraints.

3.4.4 Road user charging, road pricing and congestion charging

Road user charging is primarily a funding mechanism. Road pricing means that road users are charged in accordance with the real costs of motorised traffic, and the charges are usually highest during peak hours. Congestion charging is means of reducing queues in central areas, by making it more expensive to drive there, with prices being highest during the daytime. Although the technology is similar for each of these options, the political objectives and management philosophies are different.

In Oslo-Akershus, road user charging has been used to generate funds for better transport. The proposed congestion charging in Gothenburg is designed to reduce the amount of traffic in the city. Both of these systems will also have other effects; the Oslo-Akershus system does reduce the amount of traffic, and the Gothenburg system will generate additional funds. Before introducing a system of road user charging an analysis should present the idea of a form of road charging, stating how much additional funding is needed in the region. Options for pricing must be explored, including a standard fixed charge through the whole day.
When the rationale for charging is both funding and reducing the volume of car transport, differentiated pricing could be considered, e.g. highest during peak hours.

Open political decisions are crucial for achieving long-term support. The initiative for road user charging should come from local/regional politicians, in accordance with subsidiarity principles. In Oslo the decisions were taken by locally elected bodies and ratified by the national parliament. Open debate is important in reaching a decision.

The following issues are important:

- funding options should be considered for both infrastructure and running of public transport;
- both the concept and the implementation options for road charging/road pricing must be dealt with.

Transparent financial management is essential. Revenues must be used for transport purposes alone, and the public must be given strong guarantees. A holding company should be established between the key authorities in the city and/or region, including an agreement on percentages of ownership and regarding reporting to the elected bodies.

Additional external funding is a key to success. Long-term external financial support should be built into the agreement, especially for public transport. In Oslo there is a joint venture of local and national authorities to fund infrastructure and operating costs. For other Metropolitan Regions, their national government or the EU may be more appropriate.

Road user charging can serve different goals (funding, traffic reduction), and the different goals require different pricing structures. Clear political support is needed for the implementation, while long-term arrangements support the stability of the system. Transparent financial management is essential; revenues must be used for transport purposes alone, and the public must be given strong guarantees.

Recommendations for other Metropolitan Regions

Based on the success of the Oslo-Akershus experience, the idea of developing a joint holding company to operate and manage a possible toll ring should be considered in the case of other Metropolitan Regions. The holding company should be owned by the city and the surrounding regional authority or, if there is no regional authority, by the municipalities together. There will probably be discussions on what shares the partners should own, which should form the basis for the allocation of project funding and responsibilities.

The political process for establishing a toll ring can be challenging, and should not be underestimated. A toll ring – or congestion charging – is often perceived as an additional tax on motorists, who already pay considerable taxes on fuel and vehicles. Even though the economists explain that this is a very rational way of “internalising the external costs of cars in cities”, or a form of making sure that “the polluter pays”, for each driver, company and household, road tolls make journeys cost more. Therefore the need to charge road users must be clearly established and communicated.

As described above, many Metropolitan Regions already have some kind of motorway tolls or other forms of charging for traffic conditions, so the potentials of a road user charging scheme must be seen in view of what is already in place. There will be political discussions on whether to put more taxes on car users. The different political parties will probably have different views on taxation in general, and some of them will claim that the development of new roads and public transport should be the responsibility of national authorities.

The scheme of a toll ring must have a long-term perspective. This means that it should not be a matter of political discussions in the next election. This requires broad political consensus. In Oslo-Akershus a majority of all but one of the political parties have agreed to a 20-year treaty on the toll ring, avoiding the principle policy issues that could be raised during elections or any possibility of a referendum.

Vice Mayor
Ola Elvestuen
Department of Transport and Environment in the City of Oslo, Norway

“...Our regional cooperation with Akershus over the Toll Ring, public transport services and the regional plan for land use and transport, are essential for Oslo to achieve sustainable growth. Through exchanging experiences and ideas with the other CATCH Metropolises, we have become increasingly convinced of the value of the regional level of working. I hope that this will strengthen the recognition of the Metropolitan Regions within the EU and at our national level.”

Photo: Bård Ek

Traffic in Oslo.
Photo: Marcin Szala
4 RENEWABLE ENERGIES IN TRANSPORT

4.1 Introduction
Looking into the future of transportation in Europe it is evident that this sector will need to undergo profound transitions. The transportation systems have been developed in a way that is no longer sustainable according to present criteria. Thus, the sector faces environmental, social, and economical challenges.

One of these challenges is the use of energy based on fossil fuels in transportation. The high dependency of the sector on oil products is problematic in several respects. The European transport sector is 96% reliant on oil; in 2010 the imports of oil into the EU amounted to 210 billion Euro (Roadmap ... 2011). Due to shrinking fossil resources, increasing use of such energy sources will become costly and unreliable in the future, particularly when taking into account the political instability of some of the major oil producing countries. However, a cut in oil imports could have serious negative effects on the population’s mobility and the economical competitiveness. Without a transition to other forms of energy, this high level of dependency on fossil fuels will continue in the future with implicit increases in the problems this is likely to incur.

As a result of the high dependency on fossil fuels, transportation is also responsible for a major share of the total CO₂ emissions, and the specific amount of transport-related emissions is still rising. By 2050, the amount of greenhouse gas emissions in Europe could be about one-third higher than in 1990. Past and recent successes in reducing the harmful effects of transportation on the environment are becoming outweighed by a continual rise in traffic volumes. The EU member states have committed themselves to limiting the climate change induced temperature rise to 2°C in comparison to the preindustrial temperature level. In order to achieve this goal, the EU members need to reduce their total emissions by up to 95% by 2050 in comparison with 1990. The transportation sector as one of the major emission sources is obliged to contribute to this goal: the emissions related to this sector must decrease 60% compared to the level of 1990 by 2050. Consequently, the EU needs to develop a system of reliable, efficient and clean energy supply including energy for transportation purposes.

Although there is an intense discussion – mostly driven by the industry – that the CO₂ emissions can also be reduced through modern engines with lower fleet consumption, it seems to be quite clear that the EU goals in total cannot be reached only by this measure. This means that further action is necessary to make the production and distribution of renewable energy and its use in the transportation sector more efficient.

This affects:
• Transportation systems in general. These are continually being modernised and technical advances have led to a more efficient use of energy, but there is much more potential to be achieved in the future.
• The production and distribution network, which needs to be established to provide the transportation sector with energy from all kinds of renewable sources.
• Reliability in providing renewable energy. Fluctuations in energy generation are inherent in production systems that rely mostly on natural conditions (wind, sun); thus reliability and energy security must be provided through the storage of energy. This is becoming an increasingly important topic: the more renewable energy is produced and the less conventional energy provides the basic load.
Many challenges regarding the future of mobility arise out of the strong position of motorised individual transport in the EU. Although all over Europe high-capacity public transportation systems are provided, still most trips are done by car and other motorised vehicles.

The challenge for the EU members is to accommodate economic growth and assure mobility of all members of the societies without putting further pressure on environmental systems. New technologies and concepts must find solutions for these challenges. Key testing grounds for innovation in both individual and public transport are the high-density and large-scale Metropolitan Regions with their specific urban conditions. These regions are particularly affected by congestion, pollution and noise and contribute significantly to transport-related CO₂ emissions. A switch to sustainable modes of transportation is easier to implement in Metropolitan Regions because of higher population and employment densities. With higher densities and potentially shorter distances for journeys, the possibilities for non-motorised movement are greater, and the market for operating public transport is good.

Although in general Metropolitan Regions in the EU are equipped with reliable and resilient public transportation systems, the share of motorised vehicle use is high even in many parts of urban agglomerations. For decades strategies to shift passengers from cars to public transport have been the primary measure to improve air quality and the urban quality of life. Although public transportation is usually estimated as environmentally friendly, it is mostly run on the basis of diesel- or fossil-fuel-based electricity. Consequently, the public transportation sector is also under pressure to improve its energy balance and emission standards and thus contribute to the climate protection goals of the EU.

Alternative propulsion systems based on renewable energies and the emergence of new mobility concepts that link individual and public forms of transportation are primarily discussed as suitable solutions for high-density urban areas. Whether these alternatives and concepts can serve the mobility needs of the urban populations and thus will contribute to a profound transition in the transportation sector has been discussed as a central question in the project Catch-MR.

4.2 Results from the inventory

In preparation for the topic renewable energy in transport, all the Metropolitan Regions filled in questionnaires about the current and prospective use of alternative propulsion systems and renewable energy sources, as well as about aspects of governance and planning issues. The data presented in the following subchapters was derived from these inventories. Amongst others, the following topics were addressed by the inventories.

4.2.1 Aspects of governance and planning

Many aspects of governance and planning in the fields of energy and transport are covered by national or EU policies. In the inventories, the regions were asked about their own competences and responsibilities in these policy fields on a regional level. The results of the inventory show that all the Metropolitan Regions have competences for renewable energies in their jurisdiction. Additionally, nearly all the regions have energy strategies or action plans already in use; Ljubljana was in the process of adopting such a plan. Most of the regions have various competences and influences on different sectoral matters of energy strategies and energy-related infrastructures. All the Metropolitan Regions have set themselves targets...
for the reduction of CO₂ emissions, but only few have done this for other energy-related issues such as the use of renewable energies in public or private buildings, and renewable energies for consumers or governmental operations. Berlin-Brandenburg and Oslo-Akershus have set the greatest number of additional targets. Important goals in nearly all energy strategies are the reduction of energy consumption and an increase in efficiency.

To achieve this and other goals, the action plans of most of the Metropolitan Regions have key elements such as awareness raising, investments in public infrastructure and grants to private stakeholders. Additionally, many of the Metropolitan Regions have implemented specific support policies or incentives. Most of these initiatives concern CO₂ emissions, renewable energy sources, or energy efficiency. Demonstration projects, grants, investments in metropolitan infrastructure and information and promotion activities have also been implemented in some of the partners’ regions. Nearly all of the Metropolitan Regions (except Oslo and Budapest) plan to introduce new or enhance existing technologies in the field of renewable energies.

### 4.2.2 Production of renewable energies

Currently, the region Berlin-Brandenburg has a share of renewable energy production in relation to total energy consumption of little more than 10% (final energy consumption). Three regions achieve a share of 5–10%, and two regions of 1–5%. Which renewable energy sources are used differs significantly between the regions (e.g. mainly hydro power in Rome, wind energy in Berlin-Brandenburg, solid biomass in Ljubljana). In contrast to the current use of a high variety of renewable energy sources in the Metropolitan Regions, most of the regions see photovoltaics and biogas as regional renewable sources with a strong expansion potential by 2020. Three of the seven regions have quantified explicit goals for the expansion of the production and use of renewable energies.

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<th>Metropolitan Region</th>
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<th>Biogas</th>
<th>Liquid biofuels</th>
<th>Hydrogen from renewable electricity</th>
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Table 4.1: Regional renewable energy sources with a potential for use in the transport sector.

A unique situation is the case of Oslo-Akershus, where 60% of all energy consumption is from renewable sources – 57% hydroelectricity and 3% fuel wood. About 5% of this electricity comes from a dam in Akershus, and the rest comes from producers in the mountainous areas outside the region to the north and west. Only small amounts of imported electricity during cold winters are carbon-based. In the longer term, Norway has to address the dilemma of how to make the best use of the flexible and renewable energy sources that are demanded internationally without compromising the national advantages. By increasing the transmission capacity from Norway to the rest of Europe, the country’s electricity supply and consumption will in effect become similar to the European mix of renewable, hydrocarbons and nuclear. For more information, see the government commission report “NOU 2012:9, Energy study – value added, security and environment” (2012) and EU CO2 Project (2011).
Most regions already use renewable energies in passenger transport and rate renewable electricity and biogas as renewable energy sources. The partners reported a potential for significant increases in renewable energy use in transport by 2020 (see table 4.1).

The majority of the partners see advantages in the deployment of regionally produced renewable energies. Most of the partners view the likelihood of increased acceptance, together with reduced pollution, added value in the region and increased demand for renewable energies as important factors (see figure 4.1).

4.2.3 Renewable energies in private transport

The results show that the deployment of alternative propulsion systems is still at a minimal to low level in all the participating Metropolitan Regions. The alternative propulsion systems with the highest deployment rates are natural gas (CNG) vehicles and hybrid motors. This trend can also be seen in the total numbers of vehicles with alternative propulsion systems: e.g. in Rome there are more than 13,700 CNG vehicles, and in Gothenburg over 12,000 vehicles with hybrid motors (see figure 4.2).

The total number of public charging stations for alternative propulsion systems varies among the partners’ regions from zero to more than 1,000. Corresponding to the number of cars, there are mostly charging stations for electric vehicles (over 1,000 in Oslo-Akershus) or for CNG vehicles (about 60 in Berlin-Brandenburg). The significantly higher number of electric charging stations is assumed to reflect the longer charging times for electric vehicles as compared to the time needed to refuel fossil fuelled vehicles.

The potential for achieving over 50% of vehicles with alternative propulsion systems in the Metropolitan Regions is seen only in the long term (10–30 years). Nevertheless, the Metropolitan Regions use various instruments to promote alternative propulsion systems. Amongst these are research and demonstration projects, direct or indirect incentives (e.g. free parking spaces), networking activities for specific technologies, and supporting plans and policies.

4.2.4 Renewable energies in public transport

Alternative propulsion systems used in public transport are mainly electric motors (e.g. all tracked public transport in Oslo-Akershus uses hydroelectric power, and over 1,000 vehicles in Berlin-Brandenburg and Vienna-Lower Austria are electric) or motors using compressed natural gas (CNG) (e.g. 360 in Rome). Gothenburg and Oslo cover more than 25% of the non-electric energy demand of public transport by renewable energies. In Gothenburg, renewable energy is used as well for all electric trains.
4 Renewable energies in transport | Catch-MR

and trams; other Metropolitan Regions also already cover 20–30% of the electricity demand for local transport by renewable energy sources. Three of the seven partner regions have quantified goals for the use of renewable energies in public transport.

In contrast to the results for motorised private transport, some regions estimate a significant deployment of renewable energy technologies (over 50%) already in the short or medium term (less than 10 years), see table 4.2.

4.3 Review of practices

All over Europe the use of more renewable energy in transport is currently being discussed. Its practical use is especially being tested in Metropolitan Regions. Thus once again, Metropolitan Regions prove to be the main drivers of innovation in this forward-looking field of policy.

There are four main reasons for this:
- in Metropolitan Regions the necessary research and development skills are located at universities and enterprises;
- the high amount of traffic generates the critical size which is necessary for testing pilot schemes under real-life conditions;
- financial resources are available which allow the testing of innovations which are not yet economically viable;
- the multiplier effect of successful tests is higher in Metropolitan Regions, especially in national capitals (“showcase effect”).

The seven Metropolitan Regions involved in Catch-MR presented several innovative and forward-looking projects for using more renewable energy in public and private transport. Together with regional experts these projects were intensely discussed by the partners. In the following, some of the most inspiring approaches are introduced and explained.

4.3.1 Individual transport

The discussion concerning the increased use of renewable energy in individual transport currently focuses on the availability and suitability of electric cars. Although this technology is of high relevance, the discussion in Catch-MR revealed that other approaches have to be considered as well if we are to overcome the almost complete dependency on fossil fuels in private transport. Simply replacing “fossil fuel cars” with “non-fossil fuel cars” would not be sufficient. Experiences from Catch-MR show that “green” alternative propulsion systems have to be supported by a different mobility behaviour. The mobility vision of the Metropolitan Regions in the 21st century should be a life without private cars, at least in their densely populated areas.

Mobility requirements in Metropolitan Regions

Public transportation systems are the backbone of sustainable and environmentally friendly transportation in the Metropolitan Regions.
Nevertheless the partners have acknowledged that public transport alone cannot cater for every mobility need, so that a significant part of the population still relies on individual modes of transportation. Mobility needs are heterogeneous within the Metropolitan Regions. Though these regions are mostly characterised by high population densities, where public transportation can be efficiently provided, they also contain rural areas with lower densities which lack adequate transport services.

Additionally, for many members of the growing elderly population, the automobile is the only option to secure their mobility, especially in the peri-urban and rural parts of the Metropolitan Regions. But also many younger people rely on individual transport to get to their place of education and work in the core city, at least for part of the trip, e.g. to get to a park & ride facility. Furthermore, changes in household structures, e.g. the growing share of single households and single parents, and the transition to flexible working hours are tendencies requiring transportation services that are easily available and accessible. Indeed, public transportation providers have been responsive to changing mobility patterns, and new mobility concepts are developed according to these changing needs and habits; nevertheless, for many individuals, the private car is still the most attractive option to secure their independence in terms of mobility. Thus the local and regional authorities are confronted with the question of how to provide “clean” and affordable transportation solutions to those who are not willing or not able to use public transport. Furthermore they need to provide solutions for those who use a car as one element of their personal mobility, together with public modes and other non-motorised modes of transportation.

The experts from the Metropolitan Regions participating in Catch-MR identified alternative technologies and new mobility concepts that could support such solutions and also pointed out which measures the regions could implement and the limitations they may encounter.

- **Alternative propulsion technologies**

Different technologies are currently being developed and tested using fuels that emit less CO₂ emissions locally. The different existing technologies – based on electricity, hydrogen or gas – are promising options, but none of these technologies is considered to be the undisputed single solution for all challenges in mobility. It is a precondition that the energy deployed in the vehicles – whether it is electricity, hydrogen or biogas – must be produced from renewable sources. The deployment of a specific technology is rather dependent on the very specific local and regional conditions – e.g. the availability of a particular type of renewable energy in the region, the financial resources – and national legal frameworks.
**Propulsion concepts based on electricity**

All types of battery-driven electric vehicles were considered suitable for greener transport solutions in the future. Furthermore, batteries could gain importance as storage media for fluctuating power supplies from renewable sources such as wind turbines. At the moment several barriers limit the deployment of battery-driven electric vehicles, such as the limited range of the vehicles and the poor charging infrastructure. A current drawback for a broader implementation is the high purchasing costs for the individual user. Consequently, ownership and operation of these electric vehicles are currently only affordable for high-income households.

To promote the use of battery-driven electric vehicles it is necessary to further invest in battery- and vehicle-related research and development, and to reduce the economic and practical barriers. In order to achieve a large-scale and proper usage of the vehicles, a comprehensive coverage with charging facilities needs to be provided. Such interventions in the public realm are sensitive and require the cooperative action of all involved stakeholders – municipalities, energy providers, citizens and many more. Thus the broad deployment of electric vehicles is not a solution that is accomplished overnight, but is a long-term process that requires political commitment (this has also been the conclusion of other EU projects like EVUE – Electric Vehicles in Urban Europe (2012)).

With improved battery technologies and the expansion of the charging infrastructure, several Metropolitan Regions consider electric vehicles (EV) as a mobility option, especially for their high-density urban cores. Oslo-Akershus and Berlin-Brandenburg, amongst others, are conducting pilot projects with battery-driven electric vehicles and have implemented policies to support EVs. The policies of Norway and the Oslo-Akershus region are presented in an excursus.

Besides battery-driven electric cars, electrically supported bicycles have gained attention and market penetration. The use of e-bikes is attractive

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**EXPERIENCES FROM OSLO-AKERSHUS: ELECTRIC CARS AND THEIR PRIVILEGES**

In the last few years Norway has become one of the most important countries for the use of electric vehicles. Their popularity is partly linked to indirect subsidies and Norway’s involvement in developing electric cars during the 1990s. Most of the country’s EVs are used in and around Oslo.

The Oslo Metropolitan Region is confronted with several transport-related challenges in the present and the future: high levels of commuting from the region into Oslo already put pressure on the region’s transportation infrastructure. In the future the Oslo area foresees a further growth in population and estimates an increase in transport demand of approximately 60% from 2010 to 2060. At the same time, the region has a target to reduce greenhouse emissions by 50% of the 1990 levels by 2030.

Measures have been implemented to develop a more efficient, safe, accessible and sustainable transport system, including both public and private transport. This ambition is supported by the Norwegian federal strategy to support electric vehicles: they can park for free at public car parks and pass the toll roads with no charge. Electric cars can use bus and taxi lanes. No value added tax is charged at all for such vehicles and other taxes and fees are highly reduced.

Based on this national policy, the Oslo-Akershus region is expanding the infrastructure for battery-charging and is preparing the development of a fast battery-charging network. Oslo is further participating in EU research programmes to exchange experiences about electric vehicles. Together with the city of Gothenburg a “green highway” between Oslo and Gothenburg will be established.

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*Parking lot exclusively for electric vehicles in Oslo. Photo: Peter Austin*
Renewable energies in transport

Use of hydrogen as a fuel for vehicles

Hydrogen can be used for fuel cells as well as for combustion engines. It can be produced from renewable sources such as biomass and wind power. The production and storage of hydrogen is technically complex and expensive because it is highly diffuse and its energy density is quite low. Thus the main potential for hydrogen as a fuel for vehicles is as surplus power from renewable energy sources during periods of low demand.

Although the development of hydrogen vehicles started long before the recent debate on electric vehicles, hydrogen as a transport fuel has not yet been broadly deployed anywhere in Europe. Costs for producing and distributing hydrogen, as well as for vehicles and infrastructure for fuelling, are still high. Compared to electric vehicles, the hydrogen technology is also considered to be at a disadvantage because of its low energy efficiency.

Nevertheless hydrogen fuel vehicles may be a part of the solution in the future. Several projects in Germany are testing hydrogen in vehicles and are preparing the technology for its suitability in the market. Most notable is a pilot project presented during the thematic workshop in Berlin: a regionally based energy producer has recently built a hybrid power plant in Brandenburg where wind power is converted into hydrogen (see excursus). This hydrogen is distributed at five filling stations in Berlin to users of fuel cell vehicles.

The current and future role of biofuels

Some of the seven Catch-MR Metropolitan Regions consider biogas as the solution with the greatest potential to contribute to regional mobility options. The advantage of biofuels, such as bioethanol and biodiesel, is that they can be used with existing infrastructure and vehicles. Furthermore, biogas can be added to natural gas, hence further decreasing the CO₂ levels of CNG-vehicles.

The production of biofuels depends on access to the raw materials but also on the acceptance of the population. Ethical concerns about the use of food products in fuel production decrease the social acceptance of its usage in transportation. Therefore the Metropolitan Region of Berlin-Brandenburg is not pursuing the strategy of a widespread implementation of biogas use in transportation, although about 5,000 natural gas vehicles are already registered in the region and more than 50 gas filling stations add biogas to their natural gas.

Other Metropolitan Regions in the Catch-MR project have identified biogas as an important renewable energy source for their region. Rome, Oslo-Akershus and Gothenburg are investing in biogas production and plan to fuel the region’s public and private transportation vehicles with biogas on a large scale. Although the regions are pursuing different strategies to achieve their specific goals it is generally agreed that only a mix of technologies will be likely to solve the transport challenges in individual transportation. The recent progress made in the development of sustainable alternatives in individual transport might also have consequences for the development of public transport. These vehicles might be seen and used as a substitute for both public transportation and for walking or cycling, resulting in increasing congestion on the roads. Consequently all car traffic in urban areas has to be monitored, including vehicles that run on a non-fossil basis.

Furthermore strategies should not focus solely on alternative technologies and neglect the importance of users’ opinions, beliefs and behaviours.
The relevance of the users’ perspective is highlighted in a study conducted by the Province of Rome (Summary … 2011). The results show that – in the case of the Rome region – significant CO² reductions can already be achieved by a change in conventional car users’ driving behaviour and their willingness to take measures that increase car load (car pooling, etc.).

The example from the Rome study indicates that also strategies including new technologies need to address people’s attitudes towards the different transport options. Low-emission transport has to be as easy to use as possible to be broadly accepted. In order to provide attractive mobility options, alternative technologies should be built into integrated mobility concepts that meet travel needs, lifestyles and the preferences of the users.

- **New mobility concepts**

New mobility concepts such as electric car sharing in combination with public transportation can be suitable solutions to future transport needs. Concepts such as this should address the above-mentioned limitations of alternative technologies and at the same time offer attractive mobility options according to the users’ needs. The intention to develop integrated mobility solutions is based on empirical findings from several studies and projects conducted in the last ten years, e.g. the EU project SEGMENT. These findings reveal that a change in mobility behaviour is starting to happen: up to 60% of urban transport users participating in SEGMENT are willing to reduce or are already reducing their car use (Anable 2011, 12).

This change in thinking and behaviour is particularly evident for younger people. The example of Germany shows that the modal share of motorised private transport has decreased in the age group 18–24, whereas the share of public transportation has increased (figure 4.3). Furthermore, there are findings indicating that the private car has lost some of its significance as a status symbol among young people. Instead, technical devices such as smart phones have become more important, thus relatively reducing the status of the private car.
The result is that a growing share of transport users exhibit multimodal travel patterns. This type of person pragmatically uses and combines different modes of transportation as it has identified the advantages and disadvantages of the different modes for specific trip purposes and destinations. Consequently, public and individual forms of transportation are used whenever they fit the situation and the intention of the trips. These decisions also include the combined usage of public and individual modes of transportation. This multimodal mobility behaviour is at the centre of innovative mobility concepts. In these concepts, mobility services are developed that offer individual solutions as a complement to the public modes.

An essential part of these services is the integration of information and communication technology that allows users to opt for the personally most applicable mobility option among a variety of choices. Mobile devices such as smart phones and tablet computers supporting wireless internet access offer real-time information, route planning and booking of services. At the same time the aim is the efficient use of renewable energy, the reduction of total vehicle ownership and more efficient use of public urban space – thus making a contribution to sustainable urban development.

Several Metropolitan Regions have introduced sharing systems that provide electric vehicles and give a basis for the deployment of renewable energies:

- The car sharing provider car2go has offered an all-electric fleet of 300 vehicles in Amsterdam since November 2011. The number of vehicles is expected to increase to 1,000 by the end of 2012.
- The Paris Metropolitan Region began deploying about 380 electric cars in a sharing system called Autolib’ in December 2011. The number of vehicles will increase to 3,000 by the end of 2012. The envisaged network of renting and charging stations will cover the city of Paris and 45 neighbouring municipalities.
- In the cities of Hamburg and Cologne the car sharing provider cambio has added several electric cars to its conventional fleets. These vehicles are run on electricity that is produced entirely from renewable sources.
- A project testing and practising an integrated concept with several electric vehicles – pedelecs and battery-driven electric vehicles – in combination with public transportation is BeMobility in Berlin.

Figure 4.3 A decrease in the share of private motorised transport and an increase in public transport in the age group 18–24 indicates a behavioural change among young people (Maertins 2012, based on Bratzel 2011 and MID 2008).
EXPERIENCES FROM BERLIN-BRANDENBURG: BEMOBILITY

BeMobility is a project funded by the German Federal Ministry of Transport, Building and Urban Development in the context of its programme “Electric Mobility Pilot Regions”. About 40 electric vehicles are offered as part of a public car sharing system. This fleet is integrated into Berlin’s public transport system. The vehicles are provided at 15 pick-up stations in the city centre as well as in residential neighbourhoods of Berlin. Several stations are located in close proximity to major hubs of the city’s and region’s public transportation network and at long distance railway stations in order to allow easy interchange between different modes of transportation.

A mobility card was introduced temporarily in 2011 permitting its users to easily experience all of these modes (i.e. public transport, car sharing, bike sharing). One ticket allowed unlimited travel on virtually all public transport modes, 50 Euro credit for car sharing and 30 minutes of free bicycle use. Since 2010 a so-called eMobility platform has been in operation. BeMobility involves partners from transport, energy, infrastructure, information and communication, and authorities. The eMobility platform offers a first point of contact on topics that are concerned with energy, mobility and infrastructure, and serves as a central exhibition and testing ground. Major energy suppliers that participate in the project have installed a number of charging stations across Berlin that are open to the public and to car sharing members. On the eMobility platform there are about 20 stations that use different types of technology.

4.3.2 Public transport

Regarding the use of renewable energies in public transport, practices as well as technologies and challenges can be divided between rail-based public transport and buses. As rail-based transport is often already electrified, the main question is related to the origin of the electric power and the purchase of green electricity. Buses on the other hand can either use biofuels (again mainly raising the question of origin) or fleets have to be changed to alternative propulsion systems to be able to use renewable energies. Therefore, the main challenges regarding the use of renewable energy in buses concern the purchase and operation of buses with alternative propulsion systems. In the partner regions, mainly the change of bus fleets has been of importance and most shared practices have focused on this aspect.

A common topic for rail-based systems and buses is the higher costs of renewable energies as well as for acquiring buses with alternative propulsion systems. Subsidies can be helpful to implement a sustainable transport system but need to be financed. This can be achieved by making conventional transport more expensive and thus less attractive (e.g. through toll rings for cars and car parking regulations in the city centre) and at the same time using the revenues to subsidise renewable energies in public transport. Experiences from Oslo and Gothenburg show that a consistent monitoring and a transparent use of the revenues for more sustainable transport can help to increase the public acceptance of these measures.

Renewable energies in public buses

Concerning public bus systems, the focus in the partner regions is rather not on the use of renewable energies but on efficient buses and the reduction of noise and local pollution. Buses relying on alternative propulsion systems, such as hybrid buses, hydrogen, electric, and natural gas (CNG), have advantages regarding those aspects, and can, but do not have to, use renewable energies at the same time. For example, in Gothenburg, CNG-buses were introduced on the basis of natural gas – but
already with the goal of switching to biogas in the future. Another example of a CNG-based fleet can be found in Frankfurt (Oder), situated in the Berlin-Brandenburg Metropolitan Region.

Important promotional factors for introducing alternative propulsion systems in the Metropolitan Regions have been air quality standards, mitigation goals (greenhouse gas reduction) and the reduction of noise and air pollution, especially in city centres. But also the local availability of a renewable source such as biogas from waste can lead to the introduction of alternative propulsion systems, as the example from Rome illustrates.

As already mentioned above, investment costs for new fleets with alternative propulsion systems are one of the main barriers to the use of renewable energies in buses. This is especially the case for Budapest, where the whole fleet is old (average 16 years) and needs a renewal in the next few years. In Oslo and Gothenburg on the other hand, costs are not considered to be as important. Besides the general financing system of public transport, this is also due to the fact that replacements have so far been achieved through pilot projects, which are easier to finance outside mainstream budgets.

The different technologies that are able to make use of hydrogen, electric power, or gas in buses all have specific advantages and disadvantages. Trolley buses for instance might be a good solution where they already exist (e.g. Budapest). Building up new networks, however, is too expensive. Electric buses using a battery on the other hand are still quite heavy and not suitable for wide-range operation, as the charging times are a major problem. However, using high-speed charging could make electric-buses more suitable for bus lines in the near future.

Furthermore, small electric buses are already successfully in operation in special niches, e.g. in the city centre of Rome. Another example can be found in the Gothenburg Region.

Regarding renewable energies, energy production and availability are crucial factors for the usage in public transport. Biogas, for example from waste or...
gasification of biomass, can be used for transport, but also for other gas-based appliances (heating, combined heat and power). Biogas cannot compete as well as in Oslo-Akershus, as no distribution grid for natural gas exists, heating is mainly based on electric power and electricity comes from hydroelectric power. Thus, competition on biogas is low, and CNG-buses based on biogas are an important part of the present and future bus fleet in Oslo-Akershus. Furthermore, fuel cell buses using hydrogen are being introduced in this Metropolitan Region (see excursus).

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**Renewable energies in rail-based public transport**

There are possibilities to extend the use of renewable energy without high investment costs in rail-based passenger transport: since the railway system is already mainly electrified, the integration of renewable power does not require a change of fleets or other infrastructure. Furthermore, national, regional and local authorities can often use their status as owners of transport service enterprises, as well as in public procurement, to push forward the deployment of renewable energy in public transport. Regarding the current use of renewable energies in rail-based public transport, the main topic is thus the source of power deployed for electrified trains. Although these vehicles do not cause direct emissions and thus a negative impact on the air quality at the place of use, they still can cause emissions due to electricity generation elsewhere. Rail-based public transport thus is only clean and climate friendly when run on renewably generated electricity. As the deployment of renewable energy is costly, acceptance has to be gained for such an approach. An example from Berlin showed that this can be difficult, especially when the green energy is imported from far away and discussions of “green washing” arise. Critics argue that because green electricity is not a defined term, electricity products marketed as “green power” do not automatically contribute to the expansion of electricity generation from renewable energy sources. Thus, procurements of renewable energies will often only lead to a redistribution of existing “green electricity” and have no (or only minimum) effect on increasing the production of renewable energies.

**Experiences from the Gothenburg Region: Electric feeder buses**

At the end of 2012, a new railway line will be introduced in the Gothenburg Region with stations in a suburban area with a low population density. The future passengers live in the vicinity and thus a solution for their transport to/from the station (“last mile”) was needed. The solution will be a feeder bus system using battery-driven electric vehicles, as they are cleaner and less noisy. These small buses (22 passengers) will have routes of 20 minutes and can make two runs per hour as they need a charging time of ten minutes in-between. Charging will be comfortable as a non-contact induction technology system will be implemented.
Regional production of renewable energy might be an alternative that is more acceptable for many people. However, as the shift from private towards public transport is regarded to be of main importance in many partner regions, higher prices due to the purchase of green electricity are regarded as an obstacle to achieving this aim. Hence, the deployment of renewable energies in transportation does not have a high priority in most regions.

4.4 The vision of regional energy partnerships

The introduction and spreading of vehicles and transportation systems based on alternative propulsion systems and the corresponding infrastructure is only one aspect of increasing the share of renewable energy in the transport sector. Closely connected with such strategies is the question of where the renewable energy comes from.

The European Union and the member states have defined strategic goals for expanding renewable energy. However, these goals are in most cases very general and do not specifically address the transport sector or how renewable energy should be used in transport. Of course the share of renewable energy used for electrified transport, like metro, tram, train, e-cars and e-bikes, may increase with the general increase in renewable energy in the grid. But there is no mechanism that ensures that

EXPERIENCES FROM OSLO-AKERSHUS: INTRODUCTION OF DIFFERENT TECHNOLOGIES

The Norwegian National Transport Plan (2009) foresees a growth in transport demand within the Oslo area of approximately 60% towards 2060. The goal of Ruter, the public transport authority of the region, is to meet all growth in motorised transport needs with public transport, amounting to a doubling of trips by 2030. At the same time, all use of fossil fuel in public transport should be phased out by 2020.

Ruter currently has 1,100 buses, most of which rely on fossil fuels. To become climate neutral by 2020, Ruter plans to procure certified renewable electricity and to utilise different kinds of biofuels as well as hydrogen. Regarding biofuel, buses with a variety of technologies and fuels are already in use at the moment: 36 biogas buses (CBG, from waste water), 21 bioethanol buses (E95 from wood), 20 biodiesel buses (B100) and 120 biodiesel buses (B30). In addition, there are 18 hybrid buses and 5 hydrogen buses.

To be able to introduce hydrogen as an environmentally friendly fuel for public transport in the Oslo-Akershus Region, the necessary infrastructure and production of hydrogen has to be implemented first. Hydrogen buses are much more expensive than other alternative propulsion systems, as calculations by Ruter show. Still, hydrogen buses are being introduced due to subsidies and to diversify the technologies in use.
Projects like Desertec pursue the vision of generating vast amounts of cheap solar power in northern Africa and of transporting this electricity through a high-voltage, direct current grid (HVDC) to Europe. However, critics warn that this region is politically quite stable, that the required HVDC grid might be expensive and hard to realise, and that such projects might lead to new potentially problematic dependencies of our energy supply. Apart from importing electricity over long distances, it is also possible to import biomass as an energy carrier in order to overcome its endogenous limitations, but such concepts of biomass import for energetic use are often not sustainable and suffer from a lack of acceptance. Hence, operators, policy-makers, and local administrations should not rely solely on such international concepts or national goals.

Since transportation is a regional task, its energy demand should be treated as a question of regional interest too. A big advantage of renewable energy is in fact its applicability for decentralised energy generation. The regional production of energy could positively affect its acceptance among the population, because jobs are created and value added is generated at a regional level. Examples are the four solar power plants in Vienna, run by the local energy supply company, but financed by the inhabitants of Vienna. People could even be involved in the planning of renewable power plants and participate directly by profiting through fairly partitioned leasehold models, like in a small community in Brandenburg where a wind farm was established in 2010. The leasehold model distributes the leasehold profit not only among those few people on whose freehold wind turbines are installed, but fairly among all landholders who own land in the area of the wind farm according to the share of their freehold in the total area. Since no one is aggrieved by this model and people were able to influence the positioning of the wind turbines, the acceptance for wind farms is quite high.

Some municipalities have already started to use renewable sources like waste to produce biofuels for at least some vehicles, e.g. buses. However in most cases, these sources are quite limited and their use for biogas has to compete with other processes like heat or electricity generation. As the potential for renewable energy production is quite limited in most major cities, but comparably large in their surrounding rural areas, the concept of "regional energy partnerships" might be a way to foster the expansion of renewable energy in Metropolitan Regions. Regional studies from two Catch-MR partners indicate that in those two cases the potential for renewable energy production in the rural areas surrounding the Metropolises is enough to cover the energy demand of the whole Metropolitan Region. The example of Berlin-Brandenburg is described in the box.

In the region of Vienna-Lower Austria, the situation concerning the potential of renewable sources is quite similar to in Berlin-Brandenburg. However in contrast to Berlin-Brandenburg, the region has high capacities of hydropower. Together with its wind power, Lower Austria can almost cover its electricity demand by renewable energy. The high share of hydropower allows compensation for fluctuations in the generation of wind power. Pumped-storage hydropower plants – not only in Lower Austria, but also in other parts of Austria – even allow excess power from wind to be stored. Hence, there is no urgent need for new storage concepts like in Brandenburg. However, increasing shares of electric vehicles in the future are motivating activity on smart grid projects in Austria, too. Other specific problems concern the national regulation of
EXPERIENCES FROM BERLIN-BRANDENBURG: AS LONG AS THE WIND IS BLOWING

In Brandenburg, the production of renewable electricity already exceeded 11,000 GWh in 2011, which is more than 70% of its electricity demand. A detailed potential analysis has shown that by 2020, Brandenburg could already produce about 25,000 GWh of renewable electricity, which would be enough to cover the demand of the whole Metropolitan Region including Berlin. Compared to that, Berlin could only cover about 14% of its electricity demand by its own renewable sources by 2020 (figure 4.7).

However, these numbers have some practical limitations. The renewable energy sources of Brandenburg consist of more than 70% wind power and about 15% solar power. The generation of electricity from these sources fluctuates greatly. Hence, increasing shares of these power sources lead to the necessity of buffer or storage systems, which can store exceeded power in times of high power generation in order to cover the demand during times of low power production. Currently, this problem is solved by high shares of fossil power plants, which can produce electricity whenever it is needed. But since climate protection goals tend to replace fossil-based power generation by renewable sources, this issue is becoming more and more relevant.

First studies show that batteries in electric cars could contribute only little to solving this problem within the next decades. Furthermore, smart grids, new storage systems, and new market mechanisms are required to ensure that the demand side can react to fluctuations on the production side which need to be compensated for.

Comparison between the generation of renewable electricity (RE) in Berlin and Brandenburg in 2010, its potential generation in 2020, and the projected electricity demand of both regions in 2020.

Figure 4.7 Renewable electricity generation in Berlin and Brandenburg in 2010 and goals for 2020 compared to the electricity demand in 2020 (Renewable energy ... 2011).

hydropower, which means that the region cannot access its undeveloped hydropower sources without national permission.

The examples show that the challenges and the technological approaches to such regional energy partnerships are closely connected to the general conditions and specific resources in the regions. When fluctuating renewable resources, such as wind or solar power, are going to dominate the power generation like in Brandenburg, buffering and storage facilities are needed to compensate for differences between production and demand. An innovative concept to make the production of renewable electricity from fluctuating sources much more reliable and predictable was recently demonstrated in northern Brandenburg with a so-called hybrid power plant.

Another project with a linkage between renewable energies and the gas grid is GoBiGas in Gothenburg (see excursus). A similar concept at a smaller level is projected by GASAG, the local natural gas supplier in Berlin-Brandenburg.
EXPERIENCES FROM BERLIN-BRANDENBURG: HYDROGEN FROM WIND POWER – THE HYBRID POWER PLANT

In Prenzlau, located in the sparsely settled north of Brandenburg, the company ENERTRAG has built up the first hybrid power plant. An electrolyser of 500 kW uses excess power from three wind turbines of 2 MW each to produce hydrogen, which is stored in tanks. This hydrogen can be reconverted to electricity and heat by two combined heat and power units of 350 kW each, which are able to run with a variable mixture of hydrogen and biogas.

Biogas is delivered by a biogas plant nearby, which runs with biomass from local agriculture. The electrolysers are optimised by ENERTRAG for high efficiency and quick reaction to fluctuations in the electricity supply. This concept demonstrates that fluctuating renewable energy sources such as wind or solar power are able to produce back up power without any support from fossil sources. The hydrogen could also be fed into the existing natural gas infrastructure, which would allow its use far away from its production site and enable energy storage without additional storage facilities.

Furthermore, the concept shows a seminal linkage between the energy sector and the transportation sector, because the hydrogen can be used as a fuel in special cars or buses.

For that reason, ENERTRAG cooperates with a petrol station which is run by TOTAL, where part of the produced hydrogen is used to refuel suitable vehicles. ENERTRAG calculates that this concept can provide hydrogen for about 5.30 Euro/kg, based on costs of 8 cent per kWh for renewable electricity. Driving 100 km would consequently cost about 3.30 Euro (without profit and tax), which is quite cheap compared to fuel costs of 8 to 12 Euro per 100 km for conventional cars. The main problem is the current lack of suitable vehicles and filling stations, but the industry is working on these issues, too.

About 1,000 filling stations are planned in Germany by 2020, which is about the minimum level for the nationwide introduction of hydrogen vehicles. In the meantime, ENERTRAG is planning three more hybrid power plants in Brandenburg and another one in Schleswig-Holstein – the largest one with an electrolyser of 20 MW and 500 MW wind power.

Figure 4.8  ENERTRAG hybrid power plant (ENERTRAG … 2012).
EXPERIENCES FROM THE GOTHENBURG REGION: GOTHENBURG ENERGI BIOGAS VISION

GoBiGas (Gothenburg Biomass Gasification) is an ambitious project to supply the city and region of Gothenburg with gas from renewable sources for individual transport.

Since the 1980s the gas grid in southern and western Sweden has been delivering natural gas from Denmark. The existence of this grid is a key element in Gothenburg’s decision to produce biogas on a large scale. The project is run by Göteborg Energi, the fourth largest energy company in Sweden, in partnership with E.On. It has been co-funded by the Swedish Energy Agency with 24 Million Euro since the project was approved by the European Commission.

The gasification plant will be built in two stages in the harbour of Gothenburg. The first stage is currently under construction and will be operational in late 2012 or early 2013 as a large-scale demonstration project. It is planned to generate a total of 800 GWh per year in 2020, providing fuel for 75,000 vehicles. The liquefied methane gas will be supplied at filling stations where either liquefied or compressed methane can be fuelled. The first filling station in Sweden was built in October 2010.

► 4.5 Lessons learned

Experiences from the seven Metropolitan Regions show that the use of renewable energy in transport offers many realistic options and possibilities. This holds both for public and private transport and for behavioural and technological changes. Differences occur especially with regard to the time frame. While some solutions can be implemented directly or in the short term, others require a mid-term and long-term perspective.

- Highest potential in public transport for an increased use of renewable energy

Generally, the public transport sector has the highest potential for an increased use of renewable energy. Due to high energy consumption, in part no need for technical changes (“green power”) and direct political leverage, short-term and significant changes would be possible. A similar potential for alternative propulsion systems in individual transport is only seen in the long term. However, renewable energies in public transport will cause additional costs not only for their purchase but often also for the introduction of vehicles with alternative propulsion systems. Thus, financing is a crucial factor, one solution being additional financial sources, e.g. funds generated through congestion charges or toll rings. Thus, in regions where public transport systems are (partly) financed by such instruments, more financial means exist to expand the usage of renewable energies.

![Biogas and Natural Gas - working together](image)

**Figure 4.9** Natural gas and biogas are working together (Forsgren 2011).
■ Public transport remains the backbone

Public transport remains the backbone of efficient transportation in the Metropolitan Regions. Nevertheless, new sustainable solutions for individual transportation are required. They should be considered as complimentary to the public modes.

■ Stronger focus on behavioural changes

Users’ behaviour and attitudes need to be considered and tackled when implementing alternative propulsion systems and new mobility solutions. New attitudes and ICT-based solutions have already created new mobility patterns. Today’s multimodal mobility behaviour centres on the pragmatic use of different transport modes. New mobility concepts should support multimodal lifestyles and could thus contribute to a reduction in car traffic and car ownership.

■ Marketing and transparency crucial for acceptance

Marketing and transparency are important for the acceptance of higher costs which may result from the change to renewable energies. This is not only the task of transport and energy companies, but also demands political leadership.

■ Plurality of technological solutions and strategies

The project showed that preferences and conditions for specific technological solutions are different among the Metropolitan Regions. With regard to the time frame and the mode of transport – public or motorised private transport – solutions differ as well within the regions. Therefore a plurality of approaches is needed. The debate about prospective mobility solutions is often limited to technological aspects. The users’ needs and attitudes must be focused on far more.

■ Focus on regionally produced renewable energy

All the Metropolitan Regions have competences in renewable energy in their jurisdiction, and they have energy strategies or action plans already in use or are in the process of adopting such plans. Increased acceptance, pollution reduction, regional value creation and a higher demand for renewable energies were judged to be important advantages by most of the regions. But the source of renewable energies remains an important aspect. Especially for grid-based energies such as electricity, but often also for natural gas, the source is only guaranteed by certificates. This creates discussions about “green washing”, especially if power is imported from other countries. Regionally produced renewable energy sources may thus also enhance the credibility – especially of green electricity – and provide new opportunities for regional value creation.

■ Metropolis and Region: Potential for regional energy partnerships

Regarding the origin of the renewable energy, a low potential of renewable energies in the Metropolises and a high potential in their rural surroundings seems to be characteristic for the Metropolitan Regions. Regional energy partnerships could overcome this difference and ensure the expansion of renewable energies as well as their acceptance among the population. The examples from the regions show that there are many possibilities to link renewable energies and the transport sector at a regional level. An intensified dialogue and integrated concepts between the energy and transport sectors are necessary. Since these challenges are quite new, international networking based on the exchange of innovative ideas is particularly important when looking for successful solutions.

■ Metropolitan Regions: Ideal testing grounds for innovations

The results of Catch-MR on renewable energies in transport show that pilot actions and innovative projects have a good chance of succeeding because of the specific environment in Metropolitan Regions. In the Metropolises and their Regions the requirements are promising: a high density of research & development capacities, complex transport conditions to achieve realistic results, often easier access to subsidies for innovative projects, and a national showcase situation, particularly when they are capital regions like in Catch-MR.
5 CONNECTING METROPOLIS AND THE REGION

5.1 Three spheres of cooperation

A modern perception of Metropolitan Regions acknowledges good living conditions and active local stakeholders as a common goal of development. Thus, regional planners often strive for different forms of cooperation. Within the project, the discussion focused on different spheres of cooperation: firstly between the Metropolis and its functional area (Region), between different sectors, especially spatial and transport planning, and finally cooperation among formal and informal actors/stakeholders.

5.1.1 From government to more governance

Cooperation between administrative/territorial units and their individual bodies can be defined as governance. Nowadays, the concept of governance has become a central focus of political science discussions, addressing the shift from the concept of government to governance.

Government is related to formalised, elected decision-making power structures, which are further organised in hierarchical agencies with defined routines and bureaucratic procedures. Governance on the other hand is related to overlapping processes and relationships between governing bodies that may also include external actors. The aim of governance is not to change the concept of government, but to create new, additional forms of “integration out of fragmentation” and new forms of “coherence out of inconsistency” (Davoudi et al. 2008). Or as Jacquier (2010) described, “parallel hierarchies” of formalised – usually elected - government exist together with governance structures. By recognising and facilitating parallel hierarchies in this way, more flexible and innovative approaches can be developed as appropriate.

Today, governance is one of the main keys to successful processes of European integration. According to the White Paper on Multilevel Governance, Europe will be strong, its institutions legitimate and policies effective, citizens will feel involved and engaged in the processes, and so on, only if its modes of governance guarantee cooperation between the various tiers of government (The Committee ... 2009). Thus, the need for closer multidimensional cooperation between metropolitan, regional, and local authorities, different sectors and interest groups is very important.

Metropolitan-regional governance relies on a variety of functionally specialised associations and institutions, and eventually on multifunctional and multi-purpose organisation. The degree of institutionalisation and the role of non-state actors within the institutional design depend strongly on the “conditions” of metropolitan development (spatial structures, ...
Connecting Metropolis and the Region

5 Connecting Metropolis and the Region | Catch-MR

actors’ constellation, strategic orientation, etc.). In most Metropolitan Regions the regional level of planning is low in comparison to the national government and the local communities. The need for dialogue within an entire functional area and agreement on a long-term framework for regional development in residential and industrial areas, including service centres and transportation, without compromising the natural environment, is evident.

5.1.2 Expanding regions need stronger linkages

Technological and structural changes have significantly transformed the spatial relations between cities and their surrounding countryside. This is especially visible in modern Metropolitan Regions, which are expanding their functional hinterlands with better transport and communication. This expansion is reflected not only in the size of the areas of influence, but also in the amount and strength of linkages. In many cases, Metropolitan Regions have experienced growth of population (among the participating Metropolitan Regions, only the Berlin-Brandenburg region is an exception with a decreasing population) and the agglomeration of economic activities. Growth has created additional challenges in land-use and traffic planning.

Suburbanisation, especially with urban sprawl, is an important challenge. In addition to using up a lot of space, sprawling development also creates numerous problems connected with car-based transport of people and goods. The situation is further aggravated by the fact that the transformation of Metropolitan Regions has not been followed by changes in their administrative structure, neither boundaries nor functions. Because of this, coordinated traffic and land-use planning in Metropolitan Regions is made more difficult as it falls under the jurisdiction of various administrative bodies. In a number of cases, this has led to a lack of coordination in planning between individual administrative territories and between sectors.

These discrepancies have encouraged Metropolitan Regions to seek new arrangements, with a view to reducing traffic pressures through some form of joint policy and management. The responses of Metropolitan Regions have varied across Europe, and this variation is largely linked to specific local and national circumstances.

In some cases, the Metropolitan Regions have established joint bodies – for example, the Berlin-Brandenburg Joint Spatial Planning Department, the Berlin-Brandenburg Joint Transport Association (VBB), and the Eastern Region Transport Association (VOR) – and in other cases cooperation has developed at the request of the national government (e.g. harmonising the traffic and land-use planning in the Oslo-Akershus region). There have been several cases in which administrative units have cooperated voluntarily and now use the participatory process and joint management to develop more suitable solutions acceptable to everyone, for example, the Gothenburg Region Association of Local Authorities (GR) and the Vienna-Lower Austria Metropolitan Area Management (SUM). Regions where there have been no attempts to form connections are in the minority.

The manifold forms of cooperation in European Metropolitan Regions can be systemised by aspects such as legal status, spatial reach, involved actors, responsibilities and issue orientation (see Hamedinger and Peer 2011). Likewise it is challenging to extract theoretically different forms of cooperation as they tend not to correspond exactly with practical structures.

Mayor Zoran Janković
City of Ljubljana, Slovenia, President of the Ljubljana Urban Region Council.

“If we want Ljubljana to become a modern European capital in co-habitation with nature, we must endeavor to make it even greener and cleaner. Sustainable transport solutions, which are being presented in the CATCH-MR project, are by all means a step in the right direction.”

Photo: Miha Fras
## 5.2 Similarities and differences of territorial governance among the involved Metropolitan Regions

Nowadays, Metropolitan Regions are economic leaders in development within their countries and across Europe. In order for them to become more competitive, Metropolises and their surrounding regions must cooperate and have successful territorial management. This has been illustrated by the partners’ experiences shown in the previous chapters, where regional cooperation and policy coordination has enabled new and more sustainable transport solutions to be developed. The emphasis in this chapter is therefore placed on governance and the opportunities it provides for future planning and transportation.

The situation relating to Metropolitan Regional governance for each of the partner Metropolitan Regions is presented below, with important similarities and differences highlighted. The source of this comparative presentation is information from the partners themselves, and discussions at workshops during the project. Additionally, government structures are presented in boxes.

<table>
<thead>
<tr>
<th></th>
<th>Informal cooperation (e.g. regional conference, networks)</th>
<th>Formal, intermunicipal cooperation</th>
<th>Metropolitan association with organisational core (multi-purpose authorities)</th>
<th>Joint regional planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal status, legitimacy</td>
<td>No legal basis, delegates</td>
<td>Public or private law, delegates</td>
<td>Public or private law, elected councils</td>
<td>Public law, delegates</td>
</tr>
<tr>
<td>Spatial reach</td>
<td>NARROW functional city region within Metropolitan Region</td>
<td>Certain areas within the Metropolitan Region or whole Metropolitan Region</td>
<td>Metropolitan Region</td>
<td>Crossing the borders of Metropolitan Region</td>
</tr>
<tr>
<td>Actors involved</td>
<td>Representatives of local and, though partially, of regional political-administrative systems</td>
<td>Representatives of local political-administrative systems</td>
<td>Representatives of local/regional political-administrative systems, corporatist institutions, some business sector and third sector</td>
<td>Mainly regional planning institutions, local policy actors</td>
</tr>
<tr>
<td>Competences</td>
<td>Organising communication processes, exchange of information, reporting</td>
<td>Fulfilling certain public tasks (e.g. provision of infrastructure, planning)</td>
<td>Coordination, organising communication, information, decision-making, fulfilling certain public tasks</td>
<td>Deciding regional planning, coordination</td>
</tr>
<tr>
<td>Issue orientation</td>
<td>Partially cross-sectoral, “soft” policy fields</td>
<td>Mainly single issues</td>
<td>Cross-sectoral, variety of policy fields</td>
<td>Planning focus</td>
</tr>
</tbody>
</table>

Table 5.1: Systematic summary of the main differences between different modes of cooperation (Hamedinger and Peer 2011, 18–19).
1) In the case of Berlin-Brandenburg, first there was an interrelation between the land-use plan and the transport plan (although the implementation of the transport plan is the responsibility of a single constitutive unit), as well as the concentration of both Berlin and Brandenburg politics into a single department of government, the Joint Spatial Planning Department, which enables common actions and is thus an example of good governance. Their joint actions are related not only to land-use and transport planning, but also to common planning for the entire region.

2) The land-use and traffic planning departments of the City of Budapest used to communicate only rarely and mainly through writing; cooperation became more regular with the creation of the Centre for Budapest Transport (BKK). The administrative structure is two-tiered and these systems (the city and 23 district authorities) conflict in many ways, especially in the ownership of public utilities and financial resources, which is mainly in the hands of the city. There are also only a few occasional meetings between the mayor and ministers (when needed); thus there is a lack of real institutional cooperation and integration and a need for improvement.

3) The city of Gothenburg and its surrounding areas have a planning system based on multilevel governance. The most powerful level is the local level and it has both traffic and land-use planning powers, in association with regional authorities, whereas the national level is involved mainly with long-term transport planning. What is quite unusual is that cooperation between the levels mentioned above is not regulated or governed by any law. This is because they are very aware of the importance and needs of intermunicipal cooperation.

### CAPITAL REGION BERLIN-BRANDENBURG

The German federal system is a three-tier system which includes responsibilities and tasks concerning transport (development). It encompasses:

- the federal level, which is particularly responsible for setting up a legislative framework and elaborating the basis for decisions in transport policies. The federal transport infrastructure plan (Bundesverkehrswegeplan 2003), which was set up in consultation with the federal states, is the main instrument for steering investments in rail and road infrastructure.
- the Federal States (Bundesländer), which give substance to the given framework and have legislative and policy-making functions as well as administrative tasks. These tasks also include the provision of public transport and can be partly delegated to the level of the municipalities.

The Capital Region Berlin-Brandenburg consists of the two federal states Berlin and Brandenburg and is therefore responsible for the corresponding tasks. A notable situation arises from the fact that Berlin is at the same time a federal state and a municipality with all its tasks and responsibilities.

Both federal states work together closely to guarantee the best possible transport system for the Capital Region. Besides various forms of cooperation, two main instruments support this aim: a joint spatial planning authority, which ensures that all comprehensive planning topics will be harmonised, and the establishment of an integrated transport system, including a jointly organised and financed public transport, using Public Transport Plans.
In the case of the Central Hungarian Region the national level takes care of legislation, national transport policy, management of funds of the road sector, national and regional infrastructure developments (motorways, roads, railways), authorisational tasks in the fields of road, railway, water and air transport, preparation of technical regulations and guidelines for roads, national, regional and suburban public transport services, and of the EU-funded Transport Operational Programme.

The land-use plan of the Budapest agglomeration is also a national law.

On a regional level, the state-owned Pro Regio Central Hungary Regional Development Company Ltd. (Pro Régió) is responsible for management of the EU-funded Central Hungary Operational Programme (which is losing its importance due to phasing out). Pest County is responsible for land-use planning on its territory (surrounding Budapest). The local level is represented by the City of Budapest and 23 district governments within Budapest, as well as 188 local municipalities in Pest County, which take care of local land-use planning, local infrastructure, local public transportation and parking management.

The City of Budapest delegated most of its tasks related to transport to the Centre for Budapest Transport (BKK), its municipally owned transport authority, which also organises public transport in some neighbouring municipalities based on agreements.

Regional level is represented by Region Västra Götaland, which is, among other things, assigned to work with regional development and infrastructure coordination. It works to improve traffic systems, infrastructure, IT networks and public transport in Västra Götaland.

Together with the local authorities, Region Västra Götaland owns Västtrafik AB that is responsible for public transport in the form of buses, trams, trains and ferries. The municipalities are legally or contractually responsible for planning and building issues on a local level and have exclusive planning powers. They have by own free will chosen to shift some of the powers to the Gothenburg Region Association of Local Authorities, which is the regional planning authority and thus the second institution on a regional level. The GR is assigned by the municipalities to coordinate all regional infrastructures concerning the whole region or more than two municipalities.
CITY OF OSLO-COUNTY OF AKERSHUS

Oslo-Akershus consists of the following directly elected bodies:

a) the core city of Oslo, which has both municipal powers for land-use planning and county responsibility for economic development and transport services in the city;
b) the County Council of Akershus, which has guidance powers for land use and responsibility for regional economic development and public transport in the county;
c) 22 municipalities within Akershus, which have responsibility for land-use planning as well as technical services.

The government has a regional office that serves both Oslo and Akershus, with responsibility for control of local government finance and the environment and for ensuring that national policy is followed up in regional and local development matters, including arbitration on planning disputes when necessary.

PROVINCE OF ROME

In Italy the Ministry of Transport provides the main transport-related guidelines through the Master Plan of Transport and Logistic (Piano Generale … 2001) and is thus responsible for basic transport regulations and planning.

Management of transport systems on a regional level is in the domain of the Lazio Region and its organisations: the Transport Department, AREMOL mobility management public company, ASTRAL viabilità road management public company and the COTRAL public transport company.

Regional planning should be coherent with national guidelines and provide direction for provincial and municipal planning.

On the provincial level the Province of Rome with its Councillorship for Mobility Policies and Councillorship for Land-Use Planning takes care of urban and mobility planning for all provincial municipalities (120) except Rome.

In 2010 the Province of Rome approved a Rome province-wide land-use plan called “Piano Territoriale Provinciale Generale” and in 2006 the Passenger Transport Plan (Piano di Bacino dei Passeggeri), which is revised every two years.

Rome city land use, transport planning and management of city services fall under the responsibility of the City of Rome (its transport and land-use Councillorship).
4) Oslo-Akershus have organised their metropolitan governance in this way: There is a long-term agreement on cost sharing for the regional investment programme between the national government and parliament, based on shared management of revenues from the toll ring. There have been good national transport and land-use planning guidelines for the last 20 years. Oslo and Akershus have joint ownership of a company responsible for public transport services, and a joint planning secretariat has recently been established to produce a land-use and transport plan for the whole region.

5) The Italian partner, the Province of Rome, has well-integrated and coordinated cooperation to some extent at every territorial level between land-use and transport planning, but a lack of coordination among various levels of government is present, for both the Metropolis and the Region.

6) The city and the region of Vienna are subject to the Austrian constitution, which guarantees them the full right to self-government. Thus, the planning of this region is divided, on the one hand between municipalities, and on the other between Vienna and Lower Austria. They need new, better approaches to governing planning actions and better coordination, interaction, and cooperation among all of them.

7) Within the Ljubljana Urban Region, as well as across the country, land-use and transport planning are integrated into the urban planning system. The state (i.e. the ministry responsible for transport) is responsible for the all public passenger transport, whereas the Municipality of Ljubljana and its public company are responsible for city buses. The Regional Development Agency of the Ljubljana Urban Region supports economic, social, and cultural activities in the central Slovenian municipalities, whereas the Council of the Ljubljana Urban Region, as a decision-

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**VIENNA METROPOLITAN REGION**

Vienna. Photo: Archive of the Vienna City Administration

The Vienna Metropolitan Region includes parts of three federal provinces: the City of Vienna, and the Federal Provinces of Lower Austria and Burgenland. Only Vienna and Lower Austria are partners in Catch-MR.

Austria is organised federally, therefore the regional level has legislative and executive powers in various fields, the most important of these for the project at hand being spatial planning law, housing, the protection of the environment and local and regional road and transport networks.

At the same time, the federal provinces are to implement federal laws. Many crucial policy fields are determined on the federal level, for example taxation (mainly), fiscal equalisation/repartition of funds or financial incentives. There is no national planning law, but decisions at the federal level often have spatial relevance, for example in the areas of forest law, transport law or rail infrastructure.

Municipalities in Austria have a constitutionally granted right to self-government which includes executive land-use planning. While the City of Vienna is a federal province and a municipality at the same time, developments in other parts of the Metropolitan Region follow the general plans and spatial planning law of the federal provinces and the concrete zoning plans of the municipalities. Regarding public transport, in addition to a basic supply paid for by the federal state, local and regional services are provided by the provinces and also municipalities.
In Slovenia the transport-related jurisdictions are assigned to the Ministry of Infrastructure and Spatial Planning, which performs tasks in the areas of railway transport, air transport, maritime and inland waterway transport and road transport, as well as tasks in the fields of transport infrastructure and cableway installations. One of its organisational units is the Slovenian Roads Agency, which undertakes professional-technical, developmental, organisational and administrative tasks relating to the construction, maintenance and protection of main and regional roads as well as some expressways, and tasks relating to transport in road freight and passenger traffic.

The only regional body is the Regional Development Agency of the Ljubljana Urban Region. It supports economic, social and cultural activities in the municipalities of central Slovenia, mainly through regional development planning and different projects. On a local level there are 26 municipalities with competences in local roads, spatial planning and city public transport.

making body, is responsible for the Ljubljana Urban Region. For coordination of regional interests in the promotion and development of regional policies, a consultative body is responsible: the Regional Development Council of the Ljubljana Urban Region.

► 5.3 Dimensions of cooperation

To define good practices in the field of cooperation, we considered several main fields of cooperation in the participating Metropolitan Regions. In this regard the focus is on joint decision-making, joint transport companies, joint planning and joint financing.

5.3.1 Joint decision-making

With regard to formal joint management, which involves cooperation on an entirely voluntary basis without specific legal provisions, the Gothenburg Region Association of Local Authorities (GR) is a good example. As already described above, this is a cooperative organisation uniting thirteen municipalities in western Sweden, whose task is to enhance intermunicipal cooperation between its member municipalities, and to provide a regional platform for networking and exchange of ideas and experiences within the region. Its focus is on regional planning, environment, traffic, the labour market, welfare and social services, competence development, education, and research. It is financed partly through annual membership fees from the member municipalities (25%) and partly through revenue from conferences and courses, investigations, and other joint-usership savings for the member municipalities. The annual turnover is approximately 18 million Euro. The dialogue between the municipalities facilitates regional decision-making, joint projects contribute to sustainable development of all the stakeholders involved, new networks are being established, new ideas are being created, and, most importantly, spatial planning is harmonised in the entire area of cooperation.

Very early on, the realisation that transport and spatial challenges extend across the borders of an individual state also led to joint planning in three Austrian states (Vienna, Lower Austria, and Burgenland). In 1978, a cross-border planning body (Plannungsgemeinschaft Ost) was established to coordinate spatial planning in the area. Initially it operated as a body for coordinating activities between the three governments, but today it serves as a strategic body for joint planning in all the three states.

2006 saw the establishment of the Vienna-Lower Austria Metropolitan Area Management (SUM), which is a joint initiative of the states of Vienna and Lower Austria. This organisation brings together the administrative and political representatives of Vienna and the surrounding municipalities of Lower Austria, has two SUM managers, and its operation...
is financed by both states. It deals with settlement issues, planning policy, landscape planning, and mobility, and its major duties involve cooperation and intermediation (developing joint solutions to cross-border challenges), providing information (exchanging opinions, and a participation process), and networking (strengthening mutual trust). Thus, SUM can be considered:

• a forum for cooperation between Vienna and the surrounding municipalities of Lower Austria;
• an instrument of cross-border coordination without further complexity added through legal instruments or institutional hierarchies;
• a service unit for the political-administrative systems of the Metropolitan Region; and
• a tool to reach common understanding by providing mutual information and building trust.

It initiates and manages projects across the borders of the states and municipalities, cooperates with planning departments and organisations, participates in and organises coordination platforms, serves as an information platform, mediates in controversial cross-border issues, and develops solutions to cross-border challenges together with regional stakeholders. Its yearly costs are approximately 200,000 Euro and are co-financed by the two states.

With regard to joint planning institutions, the case of the Berlin-Brandenburg region is very important. Here, both German states began solving open issues together immediately after Germany's reunification. To avoid problems in communication and potential issues linked to the jurisdiction of an individual state, the already mentioned Berlin-Brandenburg Joint Spatial Planning Department (GL) was established in 1996. It assumed all the regional development powers of both federal states and is now the only body in Germany that has jurisdiction over two federal units. The main objective of the GL is the provision of consistent planning for the entire territory of the Metropolitan Region, and thus its responsibilities are the limitation of urban sprawl, concentration on development cores, concentration of development along axes of settlement, protection of green areas, and limitation of the need for transport. The GL belongs equally to the Senate Department for Urban Development and the Environment of the Federal State of Berlin and to the Ministry for Infrastructure and Agriculture of the Federal State of Brandenburg as the responsible bodies for state development.

In contrast to the examples described above, the Regional Development Agency of the Ljubljana Urban Region was established based on government regulations and is the only institution of regional importance in the Ljubljana Urban Region. It was established by the City of Ljubljana and it performs the role of a regional development agency for the entire Ljubljana Urban Region in agreement with other municipalities in the region. The agency creates development programmes with a firm view of the fastest development of the region as a whole, coordinates regional structural policies, and prepares projects that are put forward for European funding. One of its main activities is transportation planning, focusing on a common park & ride plan, and public transportation in general. Even though it is in charge of preparing the regional development programme, which it must first coordinate with all the participating municipalities, its development role is relatively small because, due to the absence of the regional level, the majority of planning-related tasks lie within the primary jurisdiction of the municipalities or the state.

5.3.2 Joint transport companies

Good-quality public transport is of key importance in ensuring mobility between a Metropolis and a region. In order to achieve this goal, joint transport companies (Verkehrsverbund) have been established in both Berlin-Brandenburg and Vienna.
These are publically owned companies. In the case of the Berlin-Brandenburg Public Transport Association (VBB), the federal states of Berlin and Brandenburg are each one-third shareholders in the company, and the other third of shares is held by the eighteen districts. In Austria, the Eastern Region Transport Association (VÖR) is active, in which the federal provinces of Vienna and Lower Austria each hold a 44% share, and the province of Burgenland holds a 12% share. All of the public transportation revenue is collected as part of the joint transport associations. Approximately half of the funds comprise income from ticket sales, and the other half consist of government, federal state, district, and municipal subsidies plus other sources.

Joint transport associations plan, coordinate, and organise the entire public transportation system in their areas, award concessions, and distribute the income to transport operators. The most important feature for passengers in Berlin and Vienna was the introduction of a unified fare structure enabling customers to travel on every mode of public transport using a single ticket instead of multiple tickets as in the past. The success of transport associations is reflected in the increase in the number of passengers. In the VBB network, this number increased from 1.06 billion in 2000 to 1.27 billion in 2010, and in the VÖR network the number increased from 783 million to 908 million in the same period.

Since 2012 the region of Västra Götaland is the new public transport authority in the Gothenburg region. The strategic decisions are taken by the politicians of the regional board, which is supported by the public transport secretariat. The service supply programme for public transport is developed in cooperation between the secretariat, representatives of local government, politicians, Västrafik and other stakeholders. Västrafik is the public transport company in west Sweden and is responsible for public transport services including buses, trams, ferries and trains in the County of Västra Götaland. In May 2011 an agreement between the 49 municipalities and the Västra Götaland region was signed which made the region the sole owner of Västrafik.

In Slovenia, a project of Integrated Public Transportation is being carried out throughout the country. It is coordinated by the Ministry of Infrastructure and Spatial Planning and unified fares are planned to be introduced by 2014. This project applies a top-down principle, and so far local communities have not yet been seriously included in it. The good side of the project is the planned rate integration throughout the country, which makes sense given its small total population (two million). Meanwhile, negotiations at the local level have already begun in the Ljubljana Urban Region. In agreement with some municipalities surrounding Ljubljana, the Ljubljana Public Transportation Company (a public enterprise that provides public transportation services in Ljubljana) has begun extending its city routes from Ljubljana to other places within the Region. These routes are being financed by the City of Ljubljana and the local communities within the Region, which thus offer their residents greater transportation frequency and a uniform rate for transportation into and within the Metropolis.

In the case of Budapest the Municipality of the City of Budapest is the responsible authority for local transport. Its public company, the Centre for Budapest Transport (BKK), manages tasks and activities such as public transport, road management and maintenance, parking, taxis and transport information. Through the cross-sectoral integration of all transport modes, BKK organises the integrated mobility management. The aim of BKK is to create a centralised budgeting, collecting all revenues and determining all expenditures related to urban transport.

For the initial phase BKK is financed solely by the Municipality of the City of Budapest. In a later phase a single mobility account will be established, where transport-related revenues (such as municipal and state subventions, parking fees, road charges, fare box revenues, etc.) will be gathered and used for transport-related purposes (such as running public transport, road maintenance, etc.).

5.3.3 Joint planning

Examples of joint planning, with clear and agreed-upon joint visions, are the State Development Programme (Landesentwicklungsprogramm … 2007) and the State Development Plan (Landesentwicklungsplan … 2009) in the case of Berlin-Brandenburg, and the coordinated planning of land use and transport in the case of Oslo-Akershus.

The main idea behind the 2009 State Development Programme in Berlin-Brandenburg was to give up the practice of uniform distribution of activities in
all areas and to strengthen the strong points of an individual area. Thus the development focused on easily accessible economically active centres, in which polycentric systems of settlements with effective transportation links are being established. These starting points are further enhanced by the new Berlin-Brandenburg State Development Plan, which contains clear and binding indicator-based regulations, based on which municipalities can develop their development potentials. Thus growth zones are only allowed in areas with good transport connections and specific central functions. Development outside these areas is limited. This plan has resulted in a reduced demand for traffic. In seeking the best possible acceptance of this plan among various stakeholders, its developers are aware of the importance of including various stakeholders in the decision-making process as early as possible.

A similar approach has also been applied in Oslo-Akershus, where mandatory cooperation to produce a coordinated land-use and transport plan has been prescribed by the government. In line with this, a study showing the main areas of growth and the driving forces of urban sprawl was prepared and used for the development of the Regional Strategy for Land Use and Transport for Oslo and Akershus (Planstrategi … 2011). This strategy, which is planned to be adopted in 2012, is intended to promote effective and more compact land use, which would preserve green areas and optimise the transport network.

Another example of a document prescribed by the government is also the Regional Development Programme of the Ljubljana Urban Region (Regionalni razvojni program … 2007). Even though there is no regional administrative level in Slovenia, the programme has been prepared at the regional level, which demands coordination between all the participating municipalities. As such, it is a good example of governance; the only problem is its weak funding, which is subsequently reflected in the low degree of its implementation. In addition, due to possible funding through EU structural funds, many projects with a completely local character end up in this regional programme.

### 5.3.4 Joint financing

The toll ring in Oslo was established in 1990, based on a political agreement between Oslo, Akershus, and the national government. The government agreed to provide extra funding, equivalent to the toll revenues. During the first two periods (Oslo Packages 1 and 2), the toll was used to fund transport infrastructure. Since 2008 (Oslo Package 3) part of the operating costs of public transportation have also been funded by the toll ring.

In the period 2008–2012, about 50% of the toll charges have been allocated to public transport in Oslo and Akershus so far. At the time of writing (June 2012), a new agreement has been reached to increase this allocation to public transport to 60% of the toll ring revenues, which will be implemented subject to approval by the owning bodies. A detailed 20-year investment plan has been put forward. The key to success lies in the cross-party agreement between Oslo and Akershus politicians, with clearly defined objectives and strictly earmarked funds.

### 5.4 Lessons learned

- **Focus on functional areas**

The historical background, traditions, and cultures in the participating Metropolitan Regions are also reflected in various forms of cooperation that exist between the Metropolises and their surrounding areas. Since the hinterlands are expanding and are increasingly connected with the Metropolises, long-term planning is prudent at the level of functional areas such as Metropolitan Regions and not only at the level of individual administrative units. Connections at the level of functional regions have several advantages: the entire system in the entire area of influence can be planned and thus a greater level of integration of the area can be achieved in addition to a better interconnection between
the measures taken, which can be reflected in better results at the level of all of the administrative units included. The focus on the entire area of influence also makes it possible to include all of the driving forces, which can provide more comprehensive solutions.

- **Find your own form of cooperation**

  The examples of cooperation described above lead to the conclusion that there is no uniform concept of connecting Metropolises and Regions. Both informal cooperation in the sense of voluntary, participatory decision-making, and the establishment of a more formalised joint institution in charge of developing the policies for all the units included can be successful. Cooperation in some form appears to be essential, regardless of which form it takes, provided that a clear definition of jurisdictions is given. In the case of joint bodies, their range of activities, the sources of funding, and how they include individual stakeholders must be specified. In the case of informal governance structures, it makes sense to define clear processes to reach consensus, and a joint facilitator that will manage the process. Even if the decision-making process is informal, an umbrella institution should supervise the process and be responsible for implementing the agreed-upon activities. One also has to be aware that solutions should be sought in a consensus between all the actors involved because only in this way will the joint body be able to achieve satisfactory results.

- **Strive for integrative strategic planning**

  The task of these types of joint institutions should first and foremost be integrated strategic planning, which they could use to connect both the areas and sectors included. The Catch-MR project has drawn attention to the fact that the coordination of transport and land-use planning is essential if satisfactory results are to be achieved in each area. In addition, other factors relevant for traffic and land-use planning should also be taken into account.

- **Engage the stakeholders**

  The involvement of stakeholders helps to ensure long-term acceptability of the visions and joint strategies. In this way, a wide range of aspects and experiences can be taken into account, which makes the overall programme more robust, with the personal inclusion of individuals it is also accepted better and consequently has better results. This is especially important in long-term strategic documents.

- **Make a joint integrated strategic plan**

  By connecting various measures and consistently taking into account the solutions adopted, numerous problems that arise in spontaneous settlement development (especially dispersed settlements) can be managed and hopefully avoided. In a long-term perspective, it is also considerably more cost-effective to adhere to approved plans, because the need for additional infrastructure and the cost of public transportation can be reduced. Urban sprawl and dispersed settlement risk making public transportation less competitive, which is why it loses importance and becomes less cost-effective, and they also have negative effects on the environment. From this viewpoint, a joint integrated strategic plan is of key importance because it can outline the key directions of an area’s future development and optimise the use of available space. If it is to succeed, a joint plan should be mandatory and binding for developers and land-use and transport planning authorities, with instruments for implementation, including financing.

- **Joint financing shows dedication to a common goal**

  In this, financing is certainly of key importance because limited resources are always a concern. In a tighter financial situation, joint institutions can also prove to be an opportunity to optimise costs because, for one thing, the institution’s burden is divided among several administrative units and, in addition, the results are optimised because integrated planning can lead to multiplication effects.
Urban sprawl has developed in and around most cities as a result of housing and real estate markets, and planning policy. A large proportion of households have made a conscious decision for a quality of life which is associated with low housing density, even though this creates a dependency on private cars. There are many reasons why urban sprawl has developed, or even been encouraged. However, the downsides are also clear. Traffic congestion in core cities has long been recognised, and harmful emissions from increased car use have more recently heightened the general awareness of some of the problems associated with urban sprawl.

To reduce or avoid urban sprawl, integrated planning approaches should be introduced to optimise developments from the perspective of both land-use and transport planning. This way, sustainable development can be achieved through good usage of space and efficient transport. Because of the strong interrelations between developments in different parts of a Metropolitan Region, the policies and impacts of those developments must be considered both within and beyond the administrative borders.

- **Recommended actions:**
  - Coordinate land-use and transport planning at the level of the Metropolitan Region.
  - Include all relevant sectors within planning procedures.
  - Plan future developments near the transport nodes and along the axes of public transport services.
  - Prepare an integrated plan for all sectors.

- **Practical examples:**
  - Berlin-Brandenburg: Joint regional planning in the Capital Region Berlin-Brandenburg;
  - Vienna/Lower Austria: Metropolitan Area Management Vienna-Lower Austria (SUM);
  - Gothenburg Region: Metropolitan association with an organisational core in the Gothenburg region.
The mode in which mobility is realised and the trip length vary greatly. Many factors influence people's decisions on how to move about, including among other things, distances, transport availability and also personal preferences. People's tolerance for walking or cycling distances that take more than about 15 minutes is generally limited. In compact settlements, goods and services may be more readily accessible within walking or cycling distance. For longer trips, compact settlements can be efficiently served by good quality public transportation due to a higher concentration of demand than in dispersed settlements. This way a framework can be created in which the necessity of using a car is reduced, leading to more sustainable traffic.

The urban environment must be attractive to live and work in, as well as to move through. Simply increasing the density of residential areas is not the solution and may not be enough to encourage a modal shift towards sustainable transport. A high density of workplaces and public buildings at central locations is at least just as important. An adequate supply of green and open spaces and a balanced mix of land uses must be achieved.

The transport issues must be considered together with the land use and design of the settlement, linking this recommendation closely to the integration of land-use and transport planning and the creation of attractive intermodal nodes.

■ Recommended actions:
• Use the potentials of (re)densification, especially surrounding nodes of the public transportation system.
• Ensure a mix of compatible uses and a good local supply of goods and services.
• Protect the green structures and make public space more attractive, to make dense settlements an enjoyable place to live.

► Practical examples:
• Vienna-Lower Austria: High-quality urban design; creating acceptance for high-density settlement areas;
• Gothenburg Region: Railway station communities.

ENCOURAGING MORE USE OF PUBLIC TRANSPORT

A single organisation of transport services can also be a key to achieving a wide range of improvements in the public transport services. Joint financing, intermodal interchanges, timetable coordination, single ticketing, park & ride, and other technical and organisational integration measures between different parts of the system and region may become possible. This assumes that the long-term financial framework and allocation of tasks and responsibilities has been clarified and is well structured.

■ Recommended actions:
• Achieve political agreement on the vision and principles as a means to improve services, efficient mobility and the environment for the whole region.
• Realise a systematic process for merging and restructuring two or more organisations to improve the overall productivity without the threat of immediate cuts or redundancies.
• Try to simplify the organisation(s) that deliver(s) services to public transport. By simplifying the
funding and management structure, the owners of public transport companies are more able
to see opportunities, make strategic decisions and attain efficiency.
• Separate between the transport authority and the operator(s) and make tendering processes
  with clear requirements for delivery.
• Focus on the strategic level in your Metropolitan Region, and try to simplify the structure of
  zones and fares. Develop joint investment programs. Possibilities for competition between service
  providers should be considered within the context of achieving the strategic objectives.
• The integration of transport companies/departments may be achieved in stages.
  A single organisation for all transport in the city, a single organisation for the city and outer
  region, a single organisation for transport according to tiers of government, etc. are all relevant
  stages of coordination.

► Practical examples:
• Berlin-Brandenburg: Integrated organisation of public transport services –
  Transport association in Berlin-Brandenburg (VBB);
• Central Hungary: From sectoral planning to integrated mobility management –
  The Centre for Budapest Transport BKK;
• Oslo-Akershus: RUTER AS;
• Vienna-Lower Austria: VOR;
• Gothenburg Region: Västrafik.

STRIVE FOR JOINT FINANCING OF PUBLIC TRANSPORT ON THE REGIONAL LEVEL

Strategic management of and decisions on financing public transport in the Metropolitan Region as a
whole are key to achieving long-term, efficient, robust and flexible improvements. Long-term funding
stability is essential, including ticket revenues, and regional and national subsidies. Coordinated financing of public transport at the Metropolitan Regional level enables increases in the
overall economic efficiency due to strategic decisions and economies of scale. It supports strategic
development through the choice of priorities for investment programmes. A coordinated structure and
system for ticketing makes revenues easier to manage and services easier to communicate.

Recommended actions:
• Build up an overall picture of the financial flows and costs involved in transport across the whole
  Metropolitan Region and all the transport providers.
• Look for concrete, practical improvements to sell the concept of joint financing
  from an early stage.
• Clear legal and financial agreements must be in place for sharing costs
  and revenues between the respective management and ownership bodies.
• Financial transparency is essential.

Practical examples:
• Berlin-Brandenburg: Integrated organisation of public transport services –
  Transport association in Berlin-Brandenburg (VBB);
• Oslo-Akershus: RUTER AS;
• Gothenburg Region: Västrafik.
**ACTIVATE NEW SOURCES OF TRANSPORT FUNDING – ROAD USER CHARGING**

Road user charging is both a funding mechanism and a means to regulate traffic. Overall transport efficiency, increasing the proportion of public transport use and improving the opportunities for elected bodies to allocate more funding to transport in the region are all important objectives. Road user charging for cities is best organised at the metropolitan regional level. This ensures that all the main traffic flows are included, and that the funding can be used for strategic projects across the whole region.

With road user charging, additional funding for transport might be generated and some internalisation of the wider costs of road transport is reached. Additionally, it opens up the possibility to transfer resources from cars to public transport.

**Recommended actions:**
- Design and provide new transport options before the charging scheme is introduced.
- Design the scheme in relation to a) existing charging schemes, and b) purchasing power in the region.
- Cross-party approval is a great advantage (where possible) to initiate the program, with investment packages being the main focus.
- Open policy decisions will help to achieve long-term support.
- Introducing road user charging as a local initiative, with management of the funds at the city/ regional level, ensures subsidiarity.
- Transparent financial management gives public guarantees and legitimacy.
- Additional external funding is the key to success – introduce cost sharing with national/EU bodies.

**Practical examples:**
- Oslo-Akershus: Toll ring – Road user charging in Oslo-Akershus;
- Gothenburg Region: Congestion charging;
- Province of Rome: Increased competitiveness for public transport and improved access to the city through reduced fares for Metrebus Lazio (annual card for public transport).

**MAKE INTERMODAL NODES MORE ATTRACTIVE PLACES**

Intermodal nodes between different public transport services can make a considerable contribution to the efficiency and attractiveness of public transportation. They should provide pleasant environments for all users and, where there is sufficient space, include shopping and other services. Intermodal transport nodes should be strengthened as an important driving force for efficient public transport development in the metropolitan fabric.

**Recommended actions:**
- Provide easy access and transfer between different transportation nodes.
- Provide multiple services that could attract more people.
- Identify and try to meet the needs and expectations of users.
- Ensure public safety in the design and management of interchanges.
- Make the interchange attractive and user friendly, as well as technically effective.
Practical examples:
- Gothenburg Region: The ideal intermodal node – Guidebook on intermodality in the Gothenburg Region;
- Vienna-Lower Austria: Praterstern in Vienna;
- Berlin-Brandenburg: Potsdam main station;
- Province of Rome: Tiburtina station;
- Oslo-Akershus: Lillestrøm.

STRENGTHEN PRIVATE-PUBLIC INTERMODALITY IN THE REGION – PARK & RIDE

Park & ride is a specific choice of intermodal node which is appropriate in some cases to make public transport more accessible. This recommendation deals specifically with park & ride, because the EU has funded park & ride facilities in some of the partners’ regions and this has been a focus of study in the project. On this basis, only cautious development of park & ride is recommended, particularly in view of potentially high investment costs and other options for intermodal nodes.

Other intermodality concepts, such as bike & ride, city-bikes and car-pooling/drop-off zones, should be considered as alternatives to, or together with, park & ride, depending on the location, accessibility, available space, and on which types of transport are most common in the locality.

Intermodality should help travellers to get directly to and from major public transport services by other means. Park & ride enables people who are dependent on using their car locally to use public transport for regional journeys. There are two key approaches:

- Offering a large number of places to encourage regular car users to use public transport daily.
- Offering the flexibility of using cars in conjunction with public transport, when passengers occasionally need their car.

With park & ride in place, more people can use public transport in a more flexible way. Investments can be costly, but operating costs are relatively low. The overall costs should be compared with other options, such as regular feeder buses. Park & ride can lead to reduced pressure for densification in urban development in the short and medium term.

Recommended actions:
- Park & ride should be significantly cheaper than driving into the city, but more expensive than using public transport without a car.
- It has to be based on a good public transport service and should offer some additional car flexibility for those who need to use their car for part of the journey.
- Park & ride must be cost-effective, reflecting the cost of construction and the potential/future alternative use of the site. Parking fees should be applied in central locations, and fees or regulations linked, for example, to the use of public transport should be considered in locations outside the city centre.

Practical examples:
- Central Hungary: Facilitating access to public transport – Flexible approach to park & ride strategies in Budapest;
- Oslo-Akershus: Strømmen and Sonsveien.
START WITH LOW-COST MEASURES – PRIORITY FOR PUBLIC TRANSPORT, CYCLING AND WALKING

Strategies and measures in the field of transport are usually costly and complex. Therefore not all measures have immediate results and the inhabitants’ level of enthusiasm may fall before the strategy is completed. Quick and tangible results in the shorter term may improve public acceptance. Especially projects that encourage and prioritise cycling and walking are environmentally friendly and easier to implement, especially when they are low cost. Therefore it is useful to start with transport measures which have the potential to raise the public commitment and enthusiasm.

Recommended actions:
- Introduce more frequent services.
- Make walking and cycling safer and more comfortable, with clear priority and accessibility in the road infrastructure.
- Give public transport priority, such as separate lanes on the roads.

Practical examples:
- Central Hungary: Bus lane programme in Budapest – The bus corridor to Rákoskeresztúr/
  Supporting the soft modes as alternatives to car use – Bicycle developments in Budapest;
- Ljubljana Urban Region: Closure of the city centre to motorised transport;
- Province of Rome: Local Public Transport corridors, provincial grants to municipalities for bike sharing projects.
RENEWABLE ENERGY IN TRANSPORT

CREATE REGIONAL ENERGY PARTNERSHIPS

The discussion about renewable energy sources in Metropolitan Regions is still at an early stage. Only a few large cities may be able to generate significant amounts of renewable energy in their own territory. Now, and in the future, they will rely on imported energy. It is therefore becoming increasingly apparent that renewable energy from the region outside a core city might be an important factor. Often Metropolises are surrounded by sparsely populated areas, which may be suitable for the generation of renewable energy. Some of these regions are likely to be able to produce more energy than needed for their own consumption. Surplus power should ideally be used in nearby Metropolises. This strengthens the economic base of the region, reduces transmission losses and minimises the pressure on high-voltage power lines across Europe. Metropolises and their regions should therefore develop strategies for establishing regional energy partnerships.

Recommended actions:
- Compile a common inventory of energy supply and demand.
- Identify common interests for the partnership and agree on common goals.
- Work to achieve political agreement on a regional energy partnership and a common energy strategy between Metropolis and region.

Practical examples:
- Berlin-Brandenburg & Vienna-Lower Austria: Studies on regional energy partnerships;
- Gothenburg Region: Gothenburg Energi Biogas Vision (GoBiGas);
- Oslo-Akershus: EUCO2 project.

PREPARE FOR A DIVERSE FUTURE – SUPPORT DIFFERENT TECHNOLOGIES

As the discussion about the use of renewable energies in transport has only begun relatively recently, it is unclear today which renewable propulsion technologies and which mobility concepts will prevail in the long term. Therefore Metropolitan Regions should implement a variety of solutions and support different technologies (e.g. biogas, hydrogen, electric and hybrid vehicles). In addition, it remains important to reduce fuel consumption and the emissions of conventional vehicles. Relevant improvements are expected in the short and medium term.

Recommended actions:
- Support small innovative projects and test fields.
- Keep track of technological developments.
- Evaluate experiences with different propulsion concepts systematically.
- Seek to establish a reliable mix of renewable energy sources and storage techniques.
- Exchange experiences with the European Metropolitan Regions.

Practical examples:
- Province of Rome: Different technologies in sustainable mobility;
- Berlin-Brandenburg: Test field e-mobility;
- Berlin-Brandenburg: Hybrid energy plant, power-to-gas technology.
USE THE POTENTIALS OF RENEWABLES IN PUBLIC TRANSPORT

Currently everyone is talking about electric propulsion technologies for private vehicles. However, only few of these cars are already in use. Studies have demonstrated that it will still be a long time before private electric vehicles replace a relevant share of conventionally fuelled cars. Therefore the focus of discussion should be directed towards using renewable fuels in public transport:

- “green electricity” for trams, commuter trains and regional trains,
- biofuels and hydrogen as fuels for buses.

The use of electric power from renewable sources for electric vehicles in public transport can be realised in the short term. It needs support from the political level but does not require any investments and would be a major step towards a post-fossil future of passenger transport in Metropolitan Regions.

Recommended actions:
- Start a political discussion on the advantages of clean public transport.
- Identify the potentials of renewable energies in your region.
- Use pilot actions to promote green energies in public transport.

Practical examples:
- Oslo-Akershus: Introduction of innovative technologies in the bus fleet;
- Gothenburg Region: Electric feeder bus using induction technology;
- Province of Rome: Biogas from waste for public transport.

FACILITATE A CHANGE IN BEHAVIOUR

Changes in passenger transport are driven by people’s changes in attitudes and behaviour and by new transport means. Studies have demonstrated that the readiness to use public transport and to move away from the use of a private car is growing in Metropolitan Regions all over Europe.

Alternative models for the use of different means of transport should be encouraged and promoted. Metropolitan Regions should support transport policies which aim at the replacement of conventional cars by clean cars and reduce people’s intuitive dependency on private cars, e.g. by linking public transport with new models for (e-)bike and (e-)car sharing.

Smart phones are increasingly providing advanced information platforms in many areas, including the intelligent use of public transport. This means that travel information can be tailored to the user. Multiple mobility choices can be compared and payments made electronically, thus reducing cognitive barriers to the use of public transport.

Recommended actions:
- Use user-friendly solutions (particularly based on smart phone technologies).
- Establish an integrated electronic ticketing system.
- Provide an information platform with all relevant information on public transport and (e-)bike and (e-)car sharing.

Practical examples:
- Vienna-Lower Austria: Intermodal traveller information;
- Ljubljana Urban Region: URBANA system;
- Berlin-Brandenburg: BeMobility – A platform for integrated mobility.
GOVERNANCE IN METROPOLITAN REGIONS

THE FUNCTIONAL AREA OF THE METROPOLITAN REGION MUST BE RECOGNISED

Technological and structural changes have changed the spatial relations between cities and their surrounding countryside. This is especially visible in Metropolitan Regions, which are continually expanding spatially due to the push of economic actors and the residents, as well as to better transport and communication. Most Metropolitan Regions have experienced population growth, which often occurs parallel to a decrease in the population in the urban core. This creates additional challenges for land-use and transport planning. In particular, urban sprawl and increased car-based transport are important topics. The functional expansion of Metropolitan Regions has not been accompanied by changes in their administrative structures in many cases. With fragmented political and administrative structures, coordinated transport and land-use planning across Metropolitan Regions as a whole is necessary and challenging. Defining and recognising the area of intervention that is relevant is therefore an important step in inspiring the actors in the region to cooperate.

Recommended actions:

- Document the possibilities and the geographical context for joint action.
- Analyse the most important challenges and developments to achieve a common understanding of the possibilities.
- Reach an agreement on the issues to be dealt with, the financing and common resources and the cooperation and decision structures.

Practical examples:

- Berlin-Brandenburg: Joint regional planning in the Capital Region Berlin-Brandenburg;
- Oslo-Akershus: Regional planning programme;
- Vienna-Lower Austria: Metropolitan Area Management Vienna-Lower Austria (SUM);
- Gothenburg Region: Metropolitan association with an organisational core in the Gothenburg region;
- Ljubljana Urban Region: Regional Development Agency of the Ljubljana Urban Region.

ESTABLISH A JOINT COOPERATION PLATFORM

On the basis of the joint recognition of the extent and challenges of the metropolitan regional transport, a joint platform for communication and cooperation should be established for the planning and transport authorities across the region. A joint cooperation platform should be seen as a generic term. Joint bodies for either transportation, land use or wider regional development may be established as important steps towards possibly more comprehensive integration at a future date. To establish a joint platform, the respective roles and issues of potential conflict of the participating authorities should be identified and resolved as far as possible. Such potential conflicts may be related to any of the following:

- Regional versus local/municipal interests;
- City versus rural interests;
- Democratically elected bodies versus state sectors/departments;
- Political differences between elected bodies;
- Differing views between professions.
A cooperation platform can be established in different ways – by a common communication and information platform, which provides detailed information to all relevant political, administrative and planning bodies, by working groups that work together on common issues, by voluntary associations or by joint institutions that provide planning activities for all included entities.

**Recommended actions:**
- Establish a common platform to facilitate the exchange of information.
- Start with working groups on specific topics with all political, administrative and planning authorities.
- Informal cooperation may be a means of starting dialogue, but try to formalise arrangements to strengthen commitment.
- Ensure that there are sufficient resources to follow up the advice and recommendations.

**Practical examples:**
- Vienna-Lower Austria: Metropolitan Area Management Vienna-Lower Austria (SUM);
- Gothenburg Region: Metropolitan association with an organisational core in the Gothenburg region.

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**INCLUDE STAKEHOLDERS FROM THE VERY BEGINNING – BUILD VISIONS TOGETHER**

The essential components of the participation process are communication, trust, cooperation, and consensus. Successful management of the participation process makes it possible to achieve many goals: to understand and respect different perspectives, to shape solutions that can be broadly accepted, to prevent unproductive competition, and to strengthen the creativity and awareness of the actors. Participatory processes should enable the expression of various interests and make it possible to take them into account during decision-making and action. This includes the sharing of knowledge that is necessary to effectively carry out all sorts of activities.

The participation process contributes to better recognition of a region, what it is like and what it should be like, which is of key importance for setting goals. It is therefore necessary to take people’s opinions into account and thus emphasise the specific features of the region to position it properly in the overall structure of regions. The participation process strengthens regional identity and suggests an image that regional representatives (i.e. mayors, businessmen, heads of department, etc.) should represent. It promotes comparative advantages based on local knowledge and learning as well as the establishment of connections at the local level: between businesses, institutions (research institutions, service and education centres, chambers of commerce and industry), and public and private organisations. It is crucial to involve the stakeholders in planning as early as possible.

**Recommended actions:**
- Define the issues and the scale of the challenges that are at stake.
- Invite a network of stakeholders that are relevant for the metropolitan-area level.
- Start discussions and respect different points of view.
- Encourage the active participation of the stakeholders. Debate and wherever possible adapt their proposals and include them in plans.
- Try to highlight the main alternative suggestions and opinions and, where possible, achieve broad agreement on the joint vision and solutions.
- Implement the plans agreed upon.

**Practical examples:**
- Gothenburg Region: Participative approach in the Gothenburg region.
### 7 Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>BKK</td>
<td>Centre for Budapest Transport</td>
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<tr>
<td>BKSZ</td>
<td>Budapest Transport Association</td>
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<td>BKV</td>
<td>Budapest Transport Company</td>
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<td>Catch-MR</td>
<td>Cooperative approaches to transport challenges in Metropolitan Regions</td>
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<tr>
<td>CBG</td>
<td>condensed biogas</td>
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<tr>
<td>CNG</td>
<td>compressed natural gas</td>
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<td>EV</td>
<td>electric vehicles</td>
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<td>GL</td>
<td>Joint Spatial Planning Department Berlin-Brandenburg</td>
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<td>GR</td>
<td>Gothenburg Region Association of Local Authorities</td>
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<tr>
<td>HVDC</td>
<td>high-voltage, direct current</td>
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<td>ICT</td>
<td>information and communication technologies</td>
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<tr>
<td>InnoZ</td>
<td>Innovation Centre for Mobility and Societal Change</td>
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<tr>
<td>IÖW</td>
<td>Institute for Ecological Economy Research</td>
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<td>SUM</td>
<td>Metropolitan Area Management Vienna-Lower Austria</td>
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<tr>
<td>TEN</td>
<td>Trans-European Network</td>
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<td>VBB</td>
<td>Berlin-Brandenburg Public Transport Association</td>
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<td>VOR</td>
<td>Eastern Region Transport Association</td>
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<tr>
<td>ZRC SAZU</td>
<td>Scientific Research Centre of the Slovenian Academy of Sciences and Arts</td>
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